

Lake
Simcoe
Environmental
Management
Strategy



**STREAMBANK EROSION
INVENTORY
VOLUME II**

TECHNICAL REPORT A.3

1985

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LAKE SIMCOE ENVIRONMENTAL MANAGEMENT

STRATEGY STUDIES

STREAMBANK EROSION INVENTORY

FOR

TALBOT RIVER

BLUFFS CREEK

HAWKESTONE CREEK

ALLINGHAM CREEK

BURTS CREEK

AND

AN UNNAMED STREAM AT ORO BEACH

Prepared for the Steering Committee of the Lake Simcoe
Environment Management Strategy

by

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LAKE SIMCOE ENVIRONMENTAL MANAGEMENT STRATEGY

FOREWORD

This report is one of a series of technical reports prepared in the course of the Lake Simcoe Environmental Management Strategy (LSEMS) studies. These studies were initiated in 1981, as directed by the Cabinet Committee on Resources Development, to investigate methods of reducing phosphorus loadings from the Holland Marsh.

The studies are under the direction of the LSEMS Steering Committee, which is comprised of representatives of the following agencies:

- ° Ministry of Agriculture and Food
- ° Ministry of the Environment
- ° Ministry of Natural Resources and
- ° South Lake Simcoe Conservation Authority

This Committee expanded the SCOPE of these studies to include the total Lake Simcoe basin. This change in study mandate was made to place all sources of phosphorus loadings to Lake Simcoe into perspective. Thus the following sources were investigated:

- ° agricultural and rural runoff
- ° urban runoff
- ° streambank erosion and
- ° sewage treatment facilities.

In order to develop practical abatement measures to minimize such inputs, studies were initiated to inventory, quantify and target areas with respect to soil loss, livestock and farming operations, streambank erosion and urban runoff.

The Committee also approved Lake Simcoe studies to establish current information on lake water quality and aquatic plant growth. Such studies were required to establish baseline conditions to compare future water quality conditions. These are expected to improve, because of the following:

- ° municipal and provincial efforts to reduce phosphorus loadings from sewage treatment facilities and
- ° because of expected changes to more environmentally acceptable land use practices by developers and farmers to reduce inputs from non-point sources.

Questions with respect to the contents of this report should be directed to:

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DISCLAIMER

The material presented in these reports is analytical support information and does not necessarily constitute policy or approved management priorities of the Province and/or the South Lake Simcoe Conservation Authority. Interpretation and evaluation of the data and findings, should not be based solely on this specific report. Instead they should be analysed in light of other reports produced within the comprehensive framework of this environmental management strategy.

Reference to equipment, brand names or suppliers in this publication is not to be interpreted as an endorsement of that product or supplier by the authors, the Ministry of the Environment or the South Lake Simcoe Conservation Authority.

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Summary

The purpose of this study was to assemble a streambank erosion inventory for watercourses in the northern section of the Lake Simcoe watershed. These watercourses included the Talbot River on the east shore of Lake Simcoe, and on the west; Bluffs Creek, Hawkestone Creek, Allingham Creek, Burts Creek, an unnamed creek that flows into the lake at Oro Beach and their tributaries. This inventory is a catalogue of the locations, type, extent, and severity of all the erosion problem sites discovered. Remedial measures to alleviate the erosion problem are suggested following each site description.

A total of 123 streambank erosion problem sites on 14 streams or tributaries were identified. Nearly 70 percent of the problems were of the natural streambank erosion type. Eleven sites were identified as having major erosion problems; only one site was found to have an extremely severe erosion problem. The main stream of the Talbot River claimed the most major problem sites with 6 and it also had the single severe problem site.

Since the costs for remedial measures for the individual problem sites are highly site-specific, a range of costs has been determined. It is estimated that the costs of remedial measures for the extensive, major and severe erosion problem sites in the entire study area would be between \$180,000 and \$300,000.

1.0 INTRODUCTION

This study was conducted in order to assemble a streambank erosion inventory for watercourses in the northern section of the Lake Simcoe watershed (see figure 1). This inventory included: erosion problem site descriptions, pictures and maps of the problem sites, a problem severity rating, and suggested erosion control methods. Lastly, the range of expected costs for the implementation of remedial measures was determined.

On the east side of the lake, our investigation was centred around the community of Gamebridge. The Talbot River and its three tributaries were studied. Streambank erosion problem sites were also catalogued for the area extending north of Barrie along the shore of Lake Simcoe to just south of Orillia. The streams studied in the west include: Bluffs Creek, Hawkestone Creek, Allingham Creek, Burts Creek, an unnamed creek that flows into the lake at Oro Beach and their tributaries.

The types of streambank erosion problems identified were:

- 1) natural bank erosion (undercutting, slumping, sloughing, bank mining, etc.),
- 2) gullyng,
- 3) livestock trampling and access, and
- 4) inappropriate practices (regrading, dumping, machinery trampling, etc.).

Note that the natural bank erosion label is meant to describe the type of erosion and does not imply that the causes of the erosion problem are natural.

Each problem site received an Erosion Problem Severity (EPS) rating in the form of a numerical variable. The numerical values correspond to severity as follows:

- 1 - a minor but contributing erosion problem,
- 2 - a moderate erosion problem,
- 3 - an extensive erosion problem,
- 4 - a major erosion problem,
- 5 - a severe erosion problem.

The expected costs of remedial measures were evaluated in light of costs of recent streambank improvement projects carried out by the South Lake Simcoe Conservation Authority (SLSCA) and the Maitland Valley Conservation Authority. As the actual cost of implementing remedial measures for any individual streambank erosion problem site depends on the accessibility of the site and in-situ conditions, costs on an individual site basis have not been determined. Instead, a range of cost per type of remedial measure based on project experience was determined. Since few projects were undertaken to correct minor problems, the ranges of cost only apply to remedial measures for sites in the three worst EPS ratings.

2.0 WORK PROGRAM ACTIVITIES

The reports of prior SLSCA Streambank Erosion Studies were reviewed before field work began to familiarize the field crew with the intent of the study. The Conservation Services' Erosion Control Manual (Vol.1) was used to acquaint the field crew with the types of erosion problems and possible remedial measures. Discussions were held with the erosion study crews in order to standardize conventions used in the field work and mapping.

A data sheet was prepared so information from the field could be recorded for future use. Provisions were made on the data sheet to record information on:

- the dimensions of the problem area,
- stream and bank conditions,
- adjacent land uses,
- the type(s) of erosion at the site, and
- the severity of the erosion problem.

A section was included to record photographic information to ease the matching of site descriptions with photographs of the erosion problem. To complete the data sheet, space was reserved for a diagram or additional comments. The additional comments could, for example, include: notes on the location of the site, any structures affected by the erosion, or the possible cause or solution of the problem. An example data sheet can be found in Appendix A.

Maps and orthophotographs (air photos corrected to remove relief and tilt effects to permit accurate scaling) were surveyed prior to the field work on each section of the stream. This familiarised the crew with the location of the stream and gave them a general idea of the stream conditions. Recent aerial photographs and a stereoscope aided in plotting stream courses through heavily wooded areas.

Field work included walking the stream courses and recording erosion sites. At each site, a data sheet was filled out, a black and white photograph was taken, and the site location was recorded on an orthophotograph.

The field crew worked in the office an average of one day in five. The completed data sheets were used to prepare site descriptions. The films were developed, contact prints and enlargements of site photographs were made. The site descriptions are included in Appendix B.

During the final weeks, the crew worked in the office compiling this report. The orthophotographic maps and photographs are on file at the Conservation Authority office.

3.0 FINDINGS

A total of 123 streambank erosion problem sites were identified in the study area. Nearly 70 percent of the problems were of the natural streambank erosion type. A breakdown of the number of sites per rating and problem type is presented in Table 1 and represented graphically in Figures 2 and 3.

3.1 Talbot River - Mainstream

The Talbot River was studied from its source at the Trent Canal just north of North Brock Township concession 10, to the point where it empties into Lake Simcoe's eastern shore north of North Brock concession 8. From the source, the stream flows in a north-westerly direction for approximately 2 km. The stream then bends to the southwest for the remaining 7 km to the Lake (see Figure 4).

The river's width ranges from 10-20 m. Its depth is generally 1 m, however, the depth varies from 0.5-2.0 m. The streambanks had vegetation covering 10-80% of their surface. Land adjacent to the Talbot River was pasture land, grain fields or forested.

Of the twenty-one problem erosion sites on this river (see figure 5 and Table 2), twenty were classed as natural bank erosion types. Sixteen of these twenty sites were given erosion problem severity ratings of extensive to severe, with only one extremely severe. The remaining five sites of natural bank erosion were rated as being moderate.

3.2 Talbot River - Tributary A

The source of tributary A is southeast of Gamebridge. The stream flows generally in a southwest direction to where it meets the main stream 1 km upstream of the mouth. One branch near the source of the tributary has been ditched. It flows in a westerly direction to where it joins the main branch. See Figure 6.

This stream flowed through pasture land and fields in the upstream areas. In this stretch, the stream was approximately 0.5 m deep. Near the mouth of the stream, the channel was 15 m wide as it passed through a very densely wooded area.

No erosion problems were found on this tributary.

3.3 Talbot River - Tributary B

This tributary has three branches in total. Two branches join the main branch at a point east of highway 12 and north of the first concession road in Mara Township. One source is to the east and

one to the north of this point. The remaining branch flows in an easterly direction to join the main branch just south of the first concession and east of highway 12, just before tributary B joins the Talbot River. See Figures 7 and 8.

The total length of Tributary B and all its branches is approximately 4 km. The stream width varies from 0.2-1.5 m. The stream's depth varies from 0.1-0.5 m. Tributary B generally flows through an area of pasture land, and its streambanks range in grass cover from 20-80%.

Cattle access and trampling are the causes of two out of three of the erosion problem sites. Of these, one is rated as minor, the other is an extensive problem. The third problem site was caused by undercutting. It was rated as a moderate problem. See Table 3.

3.4 Talbot River - Tributary C

The three branches of tributary C originate southeast of highway 48 and north of concession 9 of North Brock township. The most northerly branch is the longest of the three; it flows in a westerly direction to join the main branch just before it flows under the Trent Canal. The most southerly branch is just north of concession 9. It flows in a northerly direction to meet the middle branch as they both join the main branch. See Figure 9.

The stream width varies between a minimum of 0.5 m and a maximum of 2 m. The maximum depth varies from 0.25-1.0 m.

The source of the northerly branch is a pond just east of a 2 km long stretch of swamp. This swamp extends from just downstream of the pond to where the stream reaches highway 48. Flow in this branch of the stream is blocked by several beaver dams.

The most southerly branch of Tributary C flows through a wooded area and several farm fields. A large beaver dam south of Highway 48 has backed up water for approximately 250 m.

The middle tributary's headwaters are in a small pond in a wooded area located adjacent to sod fields.

The combined branches flow through an area of pasture and residential land before joining the mainstream.

Nine sites were recorded on Tributary C (see Table 4, Figure 10). Four of these sites were caused by cattle trampling, of these, one site was given a rating of "four" on the Erosion Problem Severity (EPS) scale. Three sites, all with EPS ratings less than three, were of the natural bank erosion type. The other two sites were gullying problems with EPS ratings less than three.

3.5 Bluffs Creek - Mainstream

The main stream of Bluffs Creek originates southwest of Oro concession 9 and southeast of the sideroad which passes through Rugby. The stream flows generally in a northeast direction for 13 km to its mouth at Shingle Bay, Lake Simcoe (see Figure 11).

The stream width varies from 10 cm to 5 m and its maximum depth ranges from 5 cm to 1 m. Bluffs Creek generally flows through wooded areas and some residential and pasture land. Overall, the streambanks are well vegetated, however, on problem sites grass and tree cover may vary between 0 and 90 percent.

Minor to extensive natural bank erosion type problems were found at nine out of the ten erosion problem sites on this creek. The remaining site is due to trampling and was rated as a minor problem (see Table 5 and Figure 12).

3.6 Bluffs Creek - Tributary A

From its source between Oro concessions 11 and 12, sideroad 15-16 and Highway 11, tributary A flows 7 km northeast to join the mainstream. Approximately 1 1/2 km from its confluence with the mainstream tributary A enters a swampy area. It is in this swampy area that tributary A joins the mainstream, approximately 1 km upstream from Lake Simcoe. See Figure 13.

For most of its length the main branch of the tributary flows through maple or cedar bush and sometimes through a stretch of pasture land. The stream's width ranged between 1/2 to 2 m. Several smaller branches join the main branch of the tributary at points along its length. Near the headwaters these branches were dry.

Five of the six problem sites were located on the main branch of the tributary. Minor undercutting and slumping accounted for three of the sites. See Table 6 and Figure 14. One minor site of inappropriate practice and two sites of trampling were found. The most severe problem was a trampling site assigned an EPS rating of 3.

3.7 Bluffs Creek - Tributary B

This tributary has three branches. The main branch originates in a pond that is on the northwest side of the sideroad which passes through Rugby and is just to the northeast of that village. One branch flows south to join the main branch at a point that is south of the sideroad and southwest of Oro concession 13. The final branch flows north to join the main branch just downstream of the confluence of the other tributary and the main branch. The main tributary generally flows in an easterly direction to join the main stream just upstream of the point where Bluffs Creek

passes under the Oro-Orillia Township line (see Figure 15).

Tributary B flows through a wooded area and passes through a swamp at the confluence of the first branch and the main branch. The first branch is primarily a passageway for spring runoff flow.

Only one erosion site was found on this tributary. It was of a natural bank erosion type and rated as a moderate erosion problem (see Table 7 and Figure 16).

3.8 Bluffs Creek - Tributary C

This tributary has only one branch which has its source southwest of Oro concession 10 and north of the sideroad which passes through Mitchell Square. The stream flows east to join the mainstream upstream of the point where the mainstream crosses Oro concession 11. See Figure 17.

The stream primarily conveys spring runoff as there was little flow at this time. The streambanks are well vegetated near the source where the stream flows through an area of pasture land. The stream flows through a wooded area to join the mainstream.

One site of erosion was found on this tributary. It was a minor problem of a natural bank erosion type. See Table 8 and Figure 18.

3.9 Hawkestone Creek - Mainstream

The mainstream flows in a southeasterly direction from a marshy area at Oro Township concession 5 and sideroad 26-25 approximately 12 km to Hawkestone on lake Simcoe at concession 11 (see Figure 19). The areas adjacent to this creek are mostly forest lands but include park, residential, swamp, and pasture lands. The lands adjacent to the creek between concession 8 and 9 of Oro Township consist mostly of pasture lands.

The stream is, on average, 2.5 m wide. The depth of the stream ranges between 0.2 m to 0.4 m.

Natural bank erosion type problems account for 12 of the 15 catalogued sites (see Table 9). These problem sites range in EPS rating values of 1 to 3 (minor to extensive). One erosion site is found in each of the remaining three categories: gullying, trampling, and inappropriate practices. Most of these 15 sites have EPS ratings of 2 or less but one of the sites of trampling is considered as a major erosion problem (EPS 4). See Figure 20 for the location of the sites.

3.10 Hawkestone Creek - Tributary A

This stream originates at Highway 11 just southwest of Oro Township concession twelve. The stream flows in a southerly direction until it joins the main stream at a point just northwest of the town of Hawkestone (see Figure 21).

Near its mouth tributary A passes through a wooded area, however, most of the stream flows between farm fields. The stream channel is mainly used to convey spring runoff flow. On the day that this stream was studied, the entire channel was almost dry.

No erosion problem sites were found.

3.11 Hawkestone Creek - Tributary B

Beginning southwest of Oro concession ten and northeast of Mitchell Square, tributary B flows south for 1 km to its confluence with Hawkestone Creek (see Figure 22).

The average stream width is 20 cm and the depth of the water in the channel averages 10 cm. The area adjacent to the tributary is wooded.

No erosion problem sites were found.

3.12 Hawkestone Creek - Tributary C

The source of both branches of tributary C are in a wooded area northeast of Oro concession 7 and south of the sideroad passing through Mitchell Square. The two branches join very near to this source. The stream flows east for approximately 1 km and then turns to flow north until it meets the main stream of Hawkestone Creek (see Figure 23).

The tributary has an average width of 0.75 m and an average depth of 20 cm near its source. From approximately the midpoint of the tributary to the point where it joins the mainstream just before Oro concession 9, the stream flows through swamp. Upstream of the swamp, the banks were 100 percent covered with grasses.

One erosion site was noted on this tributary. The cause of erosion was bank undercutting and the site was given an EPS rating of 1 (minor). See Table 10 and Figure 24.

3.13 Allingham Creek - Mainstream

The source of the main stream of Allingham Creek lies in a swamp along Oro concession 8 just southeast of highway 11. The stream flows generally in an easterly direction until it reaches Lake Simcoe at the village of Simcoeside (see Figure 25).

For most of its length, Allingham Creek flows through deciduous

forest. Near its mouth it flows through a residential area, while nearer its source the stream passes through some pasture land. The width of the stream varies between 1.5 m and 2.5 m. The streams average maximum depth is 30 cm. Streambanks have vegetative cover ranging from 10 to 90 per cent.

Twelve erosion problem sites were found on Allingham Creek. Of these, nine were of the natural bank erosion types. Two sites were caused by gully action, and the remaining site was attributed to inappropriate practices. All of these sites were given ratings of minor to extensive (see Table 11 and Figure 26).

3.14 Allingham Creek - Tributary A

This tributary originates at highway 11, east of Oro concession 8. The channel primarily carries runoff from the highway and spring flow. It flows east for 0.5 km to the point where it joins the main stream (see Figure 27).

Tributary A flows through grassy fields and some wooded area.

One erosion problem site was found on this tributary (see Table 12 and Figure 28).

3.15 Burts Creek

Burts Creek originates in a low-lying area just northwest of highway 11 between the 7th and 8th concessions of Oro Township. Between highway 11, concession 8, and the first sideroad south of highway 11, the stream flows roughly southeast passing through farmland for approximately two thirds of the way, and wooded areas otherwise. South of the sideroad mentioned above the creek flows roughly east. It passes through dense brush as far as the railroad tracks. From the tracks, it flows through extensive stands of dead cedar trees, tall grasses and beaver dams until it flows through a residential area called Parkside Beach to reach Lake Simcoe. See Figure 29.

The stream was up to 40 cm deep and had an average width of 1 m.

Nine erosion sites were charted including 2 sites of minor trampling and 7 sites of undercutting and slumping. The severest EPS rating, a three, was assigned to an undercutting site where a huge tree had toppled over. See Figure 30 and Table 13. The confluence of a tributary and the mainstream east of concession 8 was within one of the trampling sites. However, no other erosion problem was found on that 400 m long tributary.

3.16 Unnamed Stream at Oro Beach - Mainstream

This stream begins as a ditch between fields at the 6th concession of Oro Township just southeast of the 15-16 Sideroad. The stream flows in a southeasterly direction to it's mouth at Oro Beach on the west shore of Lake Simcoe. See Figure 31.

North of highway 11, the stream's course is through farm fields and through two extensive forests enclosing two very large beaver ponds. South of highway 11, the watercourse continues through a generally narrow strip of forest until just downstream of the railroad, where it enters into scrub land. Here, the stream has steep, high banks. The most severe undercutting/slumping and depositional problems were encountered in this area. The only tributary joins the mainstream in this area. From a point approximately 250 m upstream of the lake down to the lake, cottagers have applied their own erosion control measures.

The average width of the mainstream was 1.5 m and the maximum depth at erosion sites ranged between 10 and 40 cm. Of the 26 erosion sites charted, 12 were of the natural streambank erosion type, such as undercutting, and the two worst of these received EPS ratings of 4. One trampling site, nine minor gullyng sites and four sites of inappropriate practices comprised the rest of the erosion problems (see Table 14, Figure 32).

3.17 Unnamed Stream at Oro Beach - Tributary A

Tributary A of this stream has two branches that both originate east of concession 6 of Oro Township; these branches join west of concession 6, a few hundred meters north of road 26-27. The tributary joins the main stream about 800 m south of road 26-27. Just before joining the main stream, the tributary flows through a swampy area. See Figure 33. The total length of this tributary, including the channel through the swamp and the two branches, is 8 km.

On the average, the width of this tributary is 0.75 m and the maximum depth ranges from 0.15 m to 0.25 m. Siltation appears to be a problem near the mouth of this tributary. Most of the adjacent land consists of pasture, cropland, and some areas of forest.

Tributary A has eight erosion problems; five of which are of the natural erosion types, two due to gullyng and one due to inappropriate practices. Five of these erosion sites are rated as moderate to minor problems (see Table 15, Figure 34). Two sites were rated as extensive problems and one of the gullies was rated as a severe problem.

3.18 Cost of Remedial Measures

It is beyond the scope of this report to determine the cost of implementing the remedial measures suggested for each individual erosion problem site. However, by combining information on the number and design specifications of the recommended remedial measures with information on the costs and design specifications of recent reported streambank improvement projects, an estimate of the range of costs for implementing remedial measures is made.

The reported costs are for remedial measures on sites with EPS ratings of 3, 4 or 5. It is unlikely that these costs will apply to sites with EPS ratings of 1 or 2. Therefore, only the number of sites with EPS ratings of 3 or greater are considered.

This estimate does not take engineering design costs into consideration and assumes labour is performed for minimum wage. These conditions duplicate those under which the actual projects were conducted.

For erosion problem sites with EPS ratings of 3 or greater it is estimated the cost of implementing remedial measures is between \$180,000 and \$300,000.

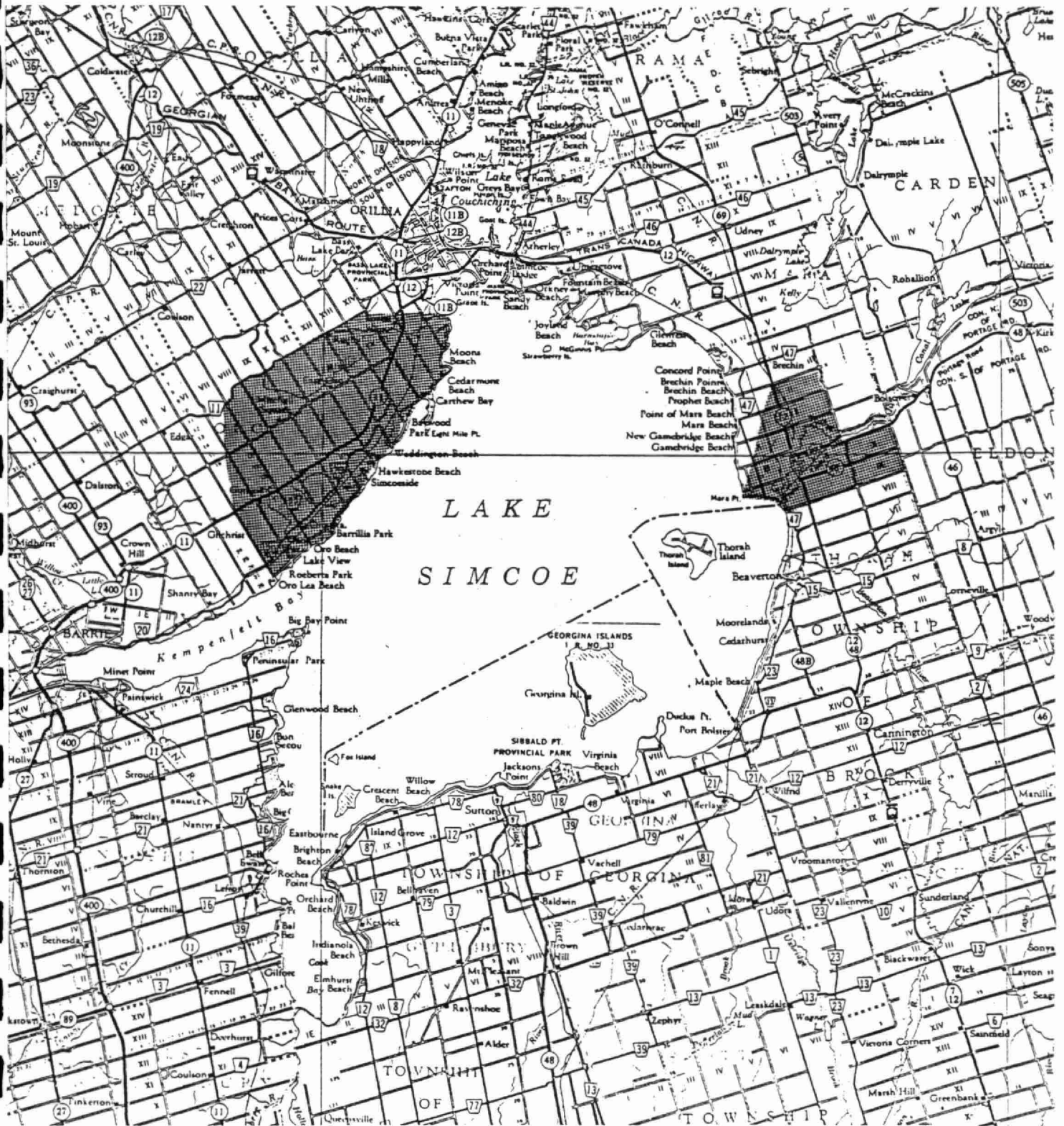


Figure 1. Study Area.

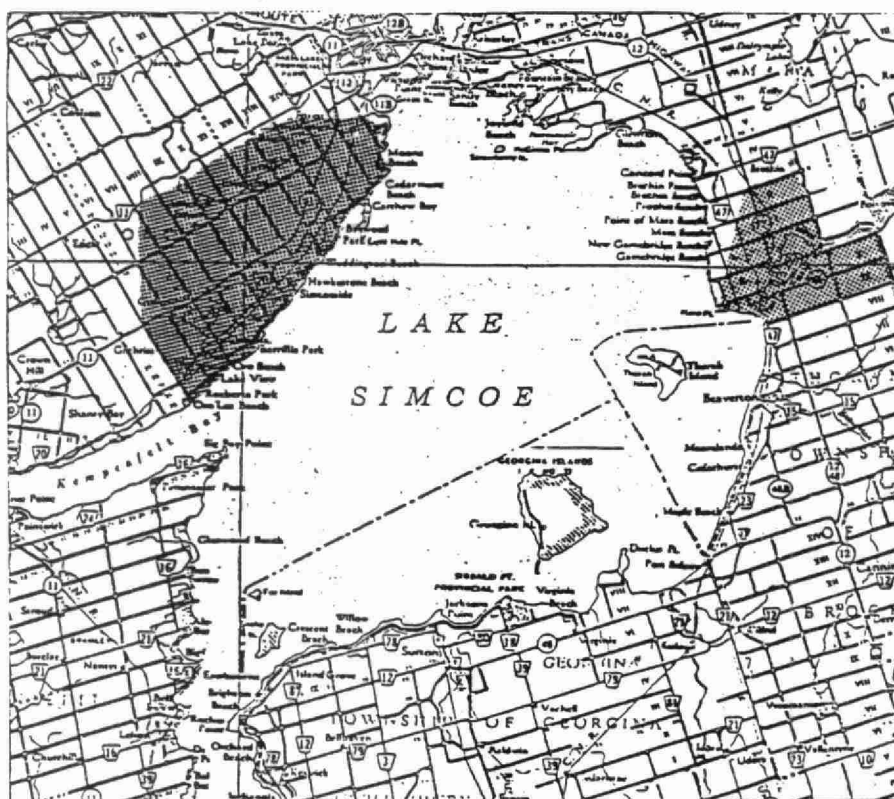
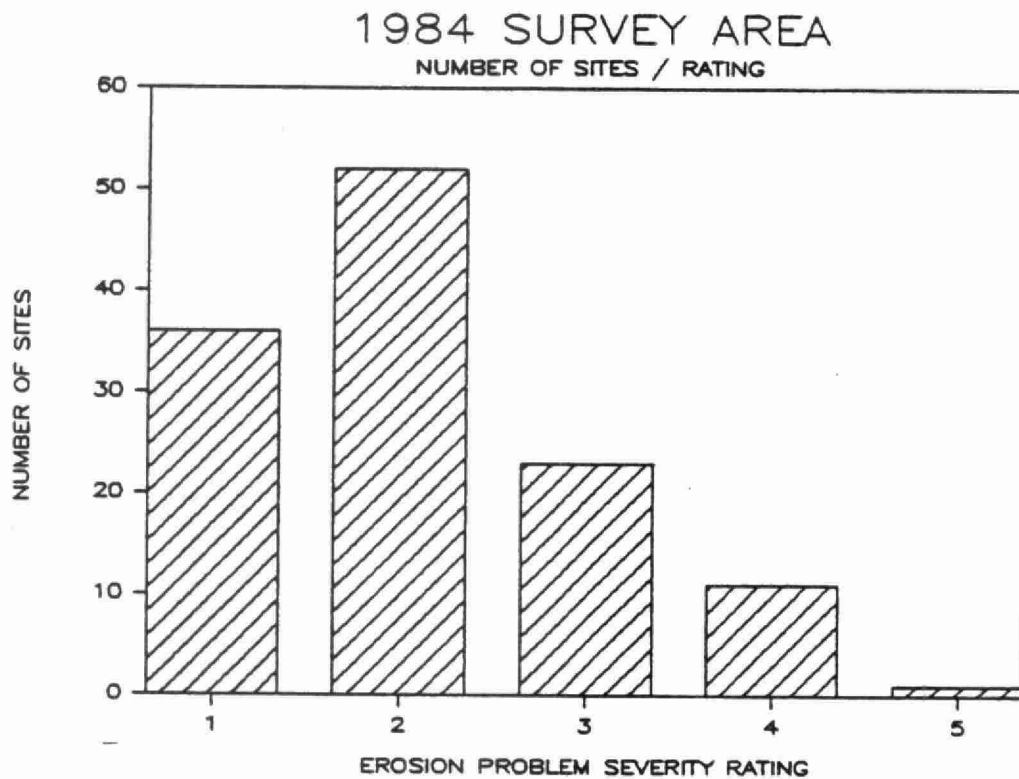


Figure 2. Number of sites per rating.

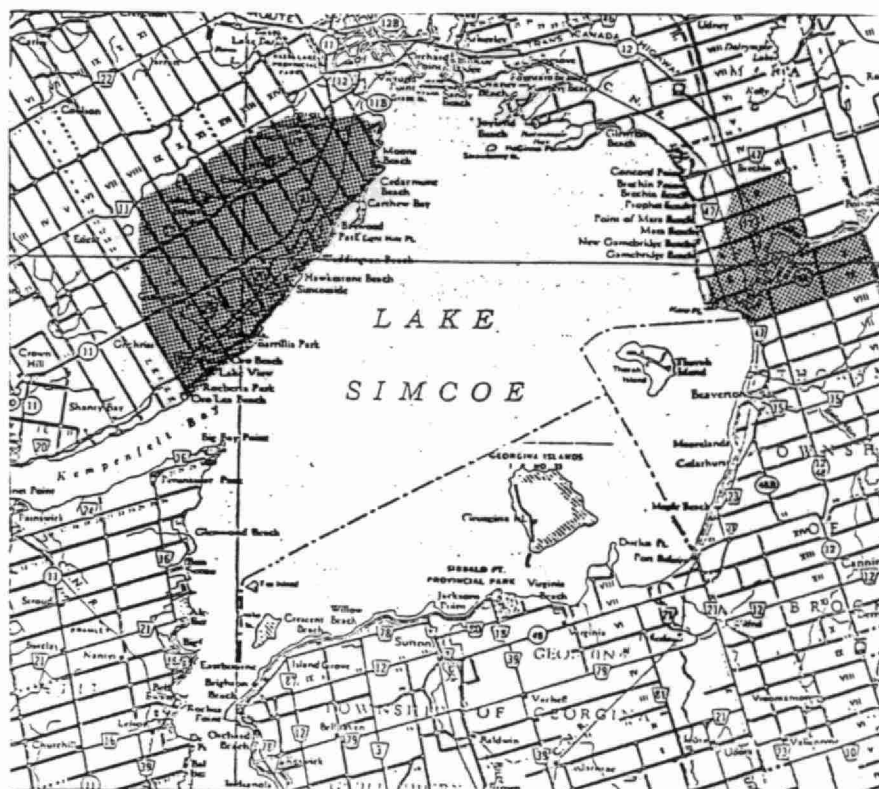
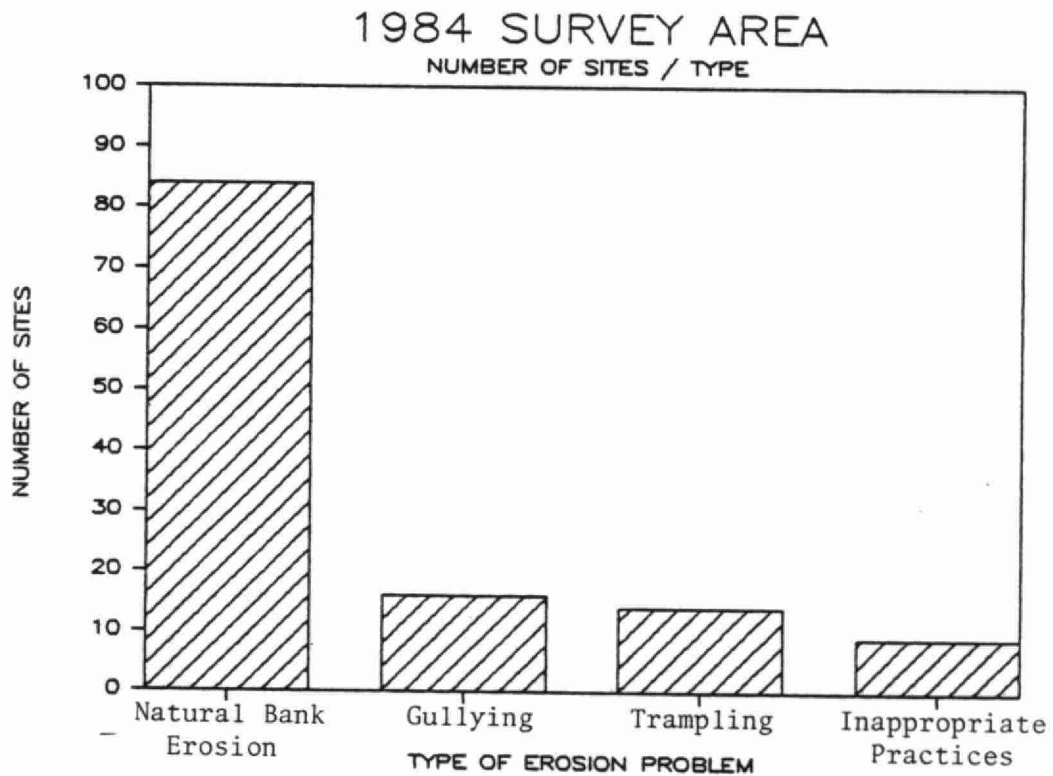


Figure 3. Number of sites per type of erosion problem.

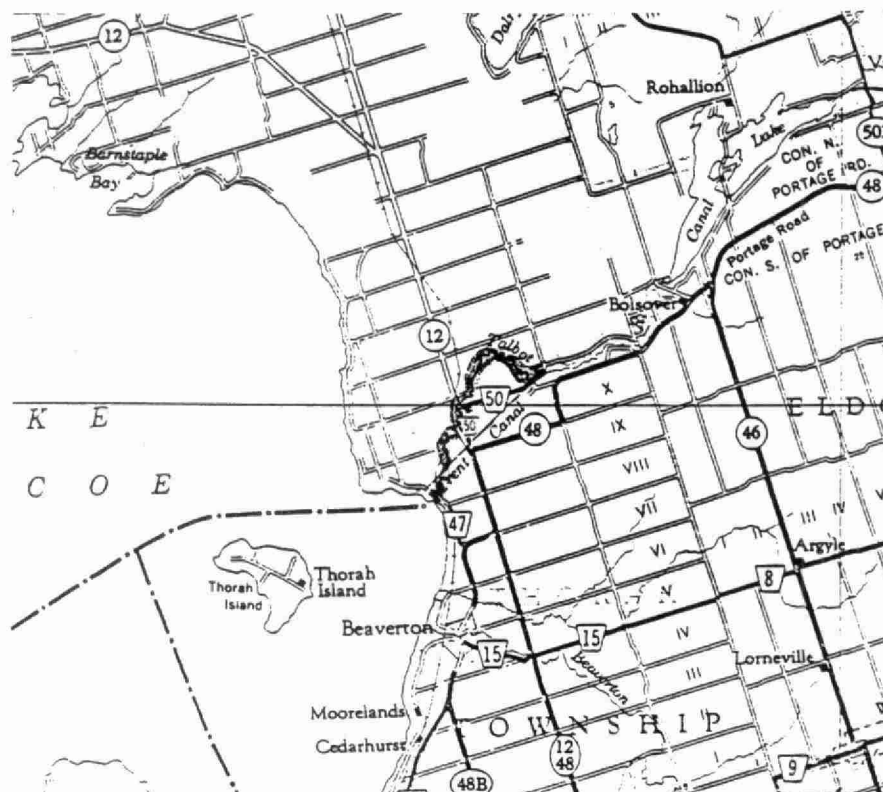
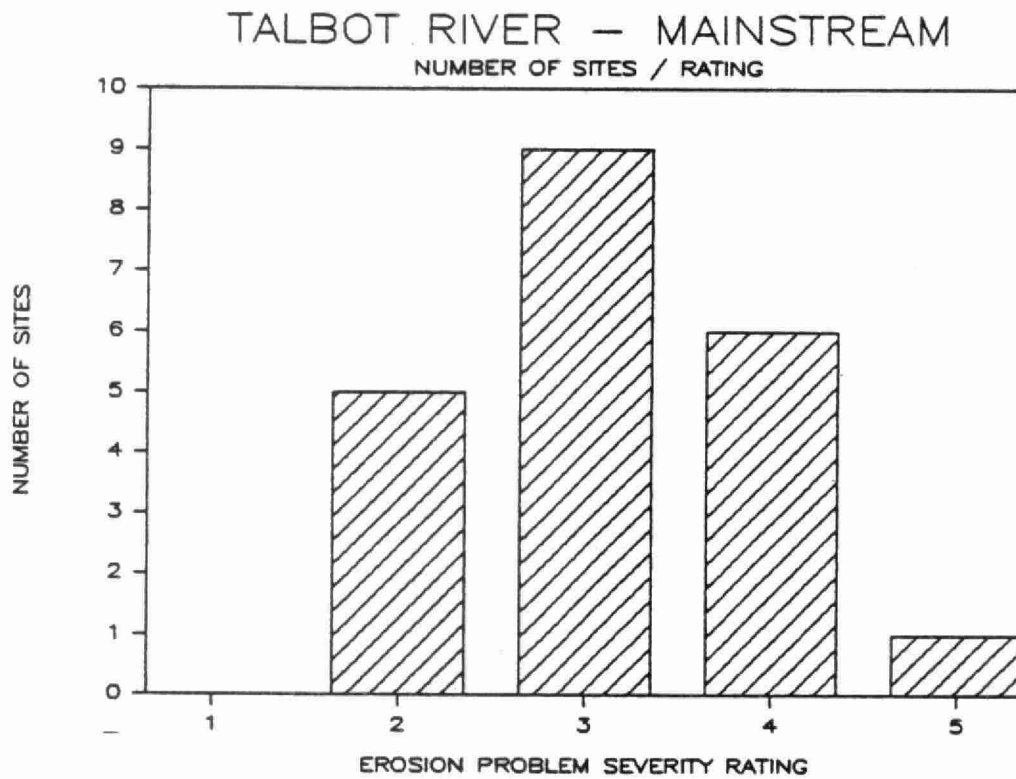


Figure 4. Number of sites per rating.

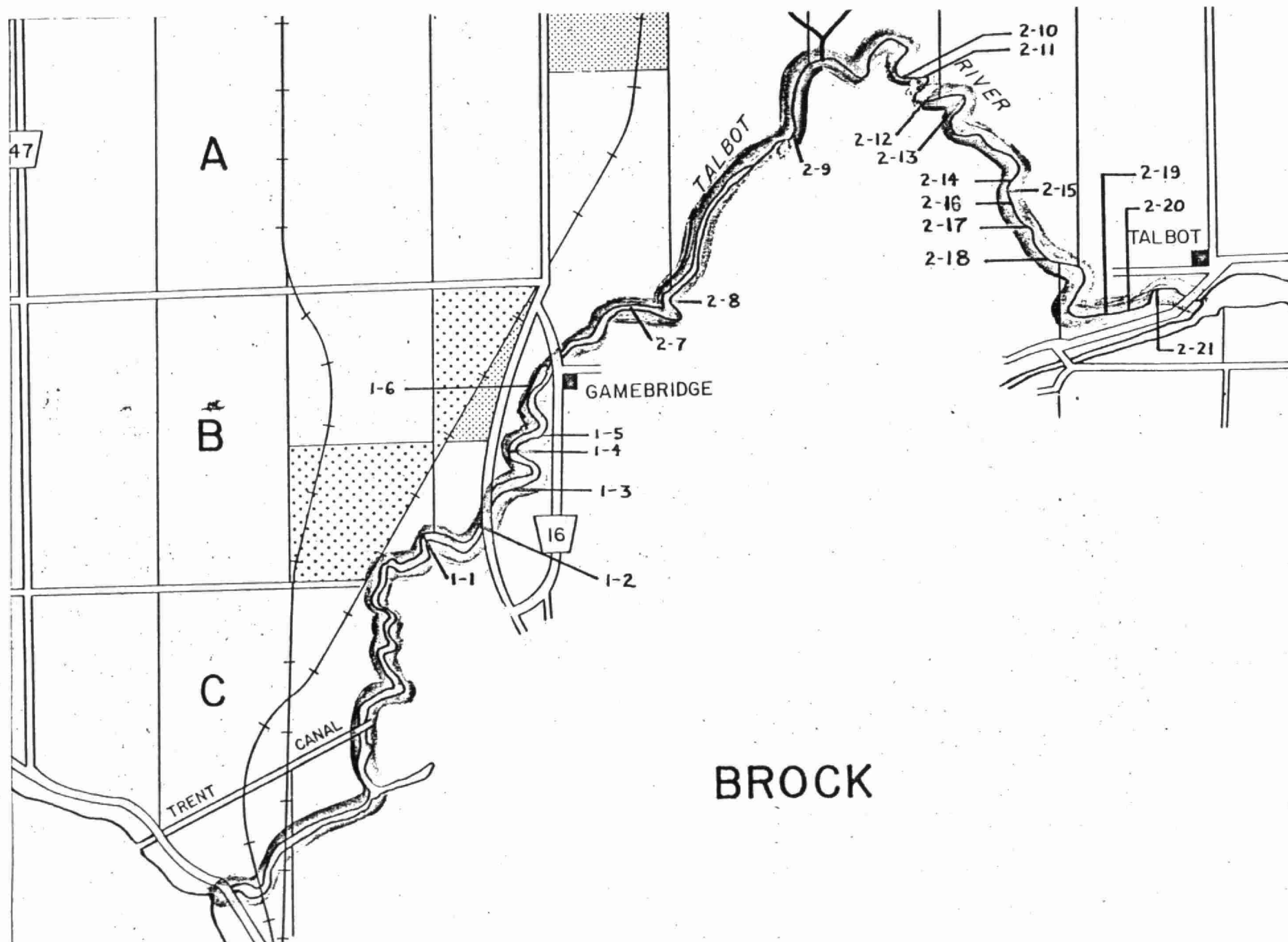


Figure 5. Location of sites. Talbot River - Mainstream.

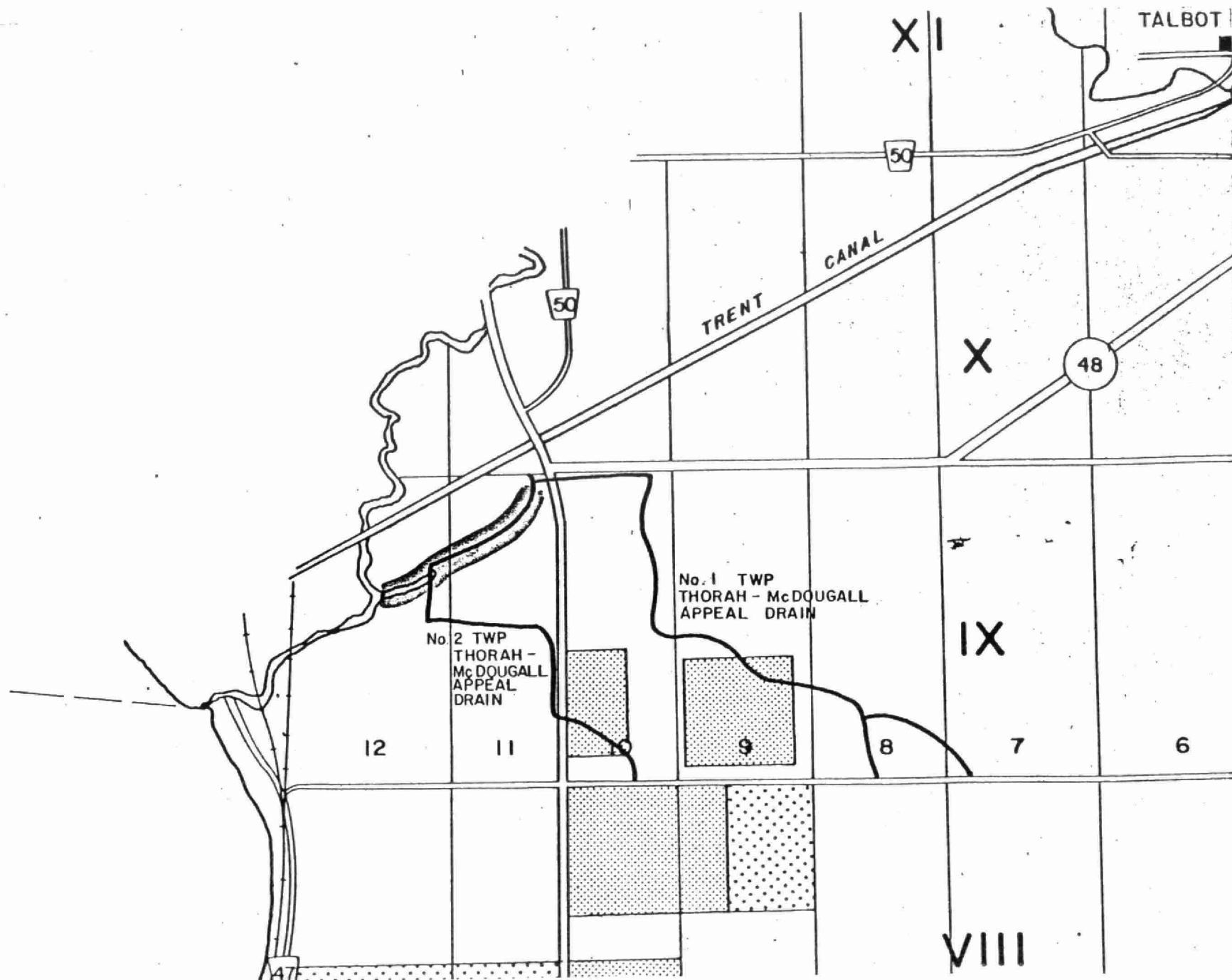


Figure 6. Talbot River - Tributary A.

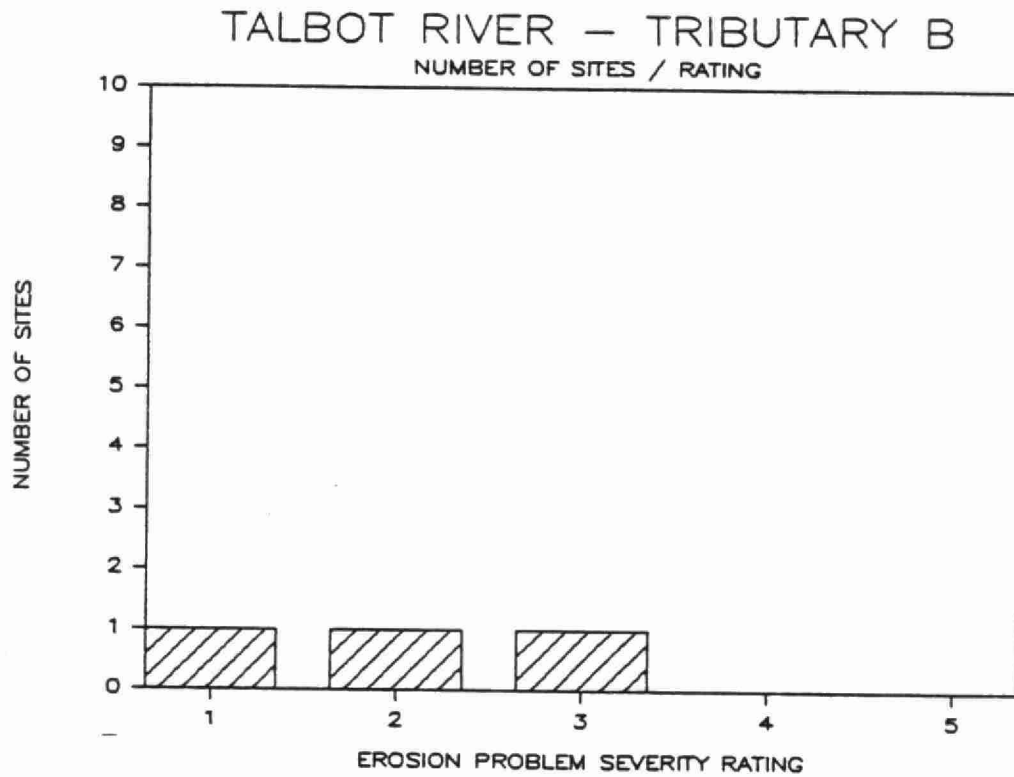


Figure 7. Number of sites per rating.

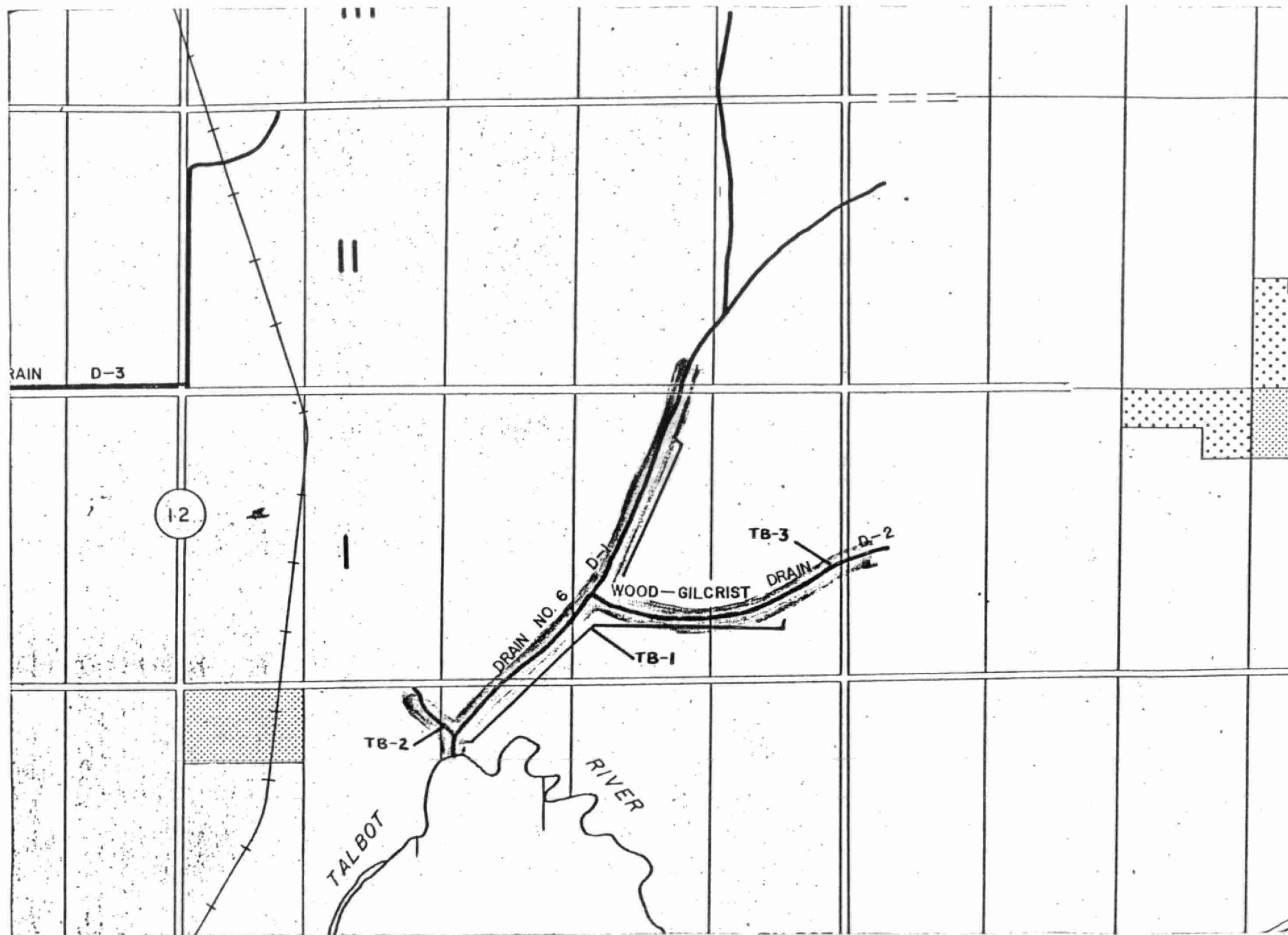


Figure 8. Location of sites. Talbot River - Tributary B.

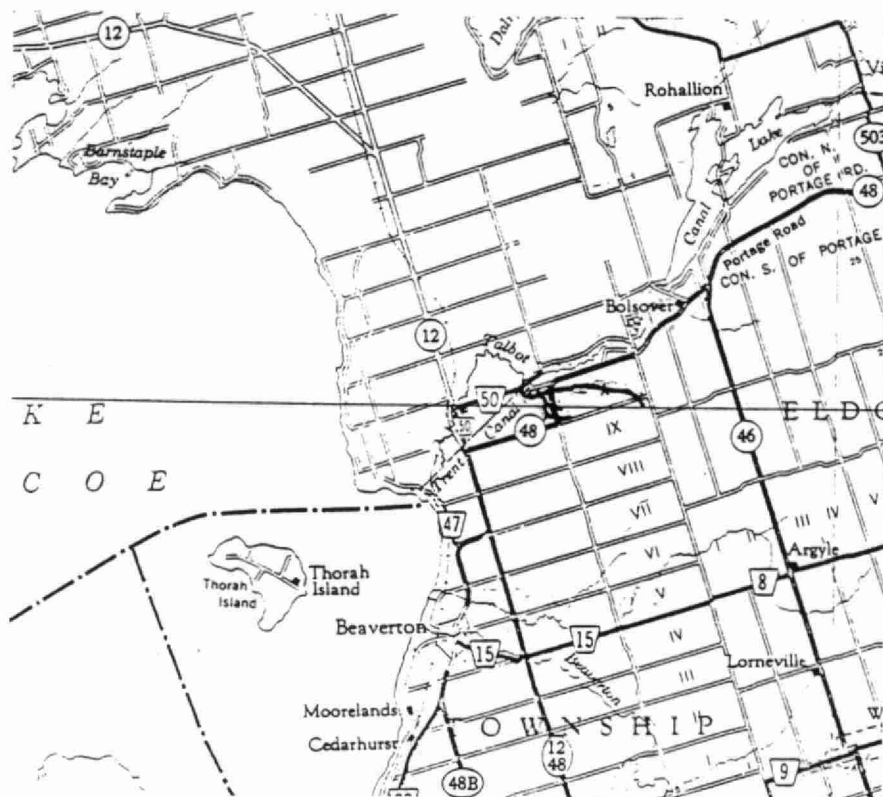
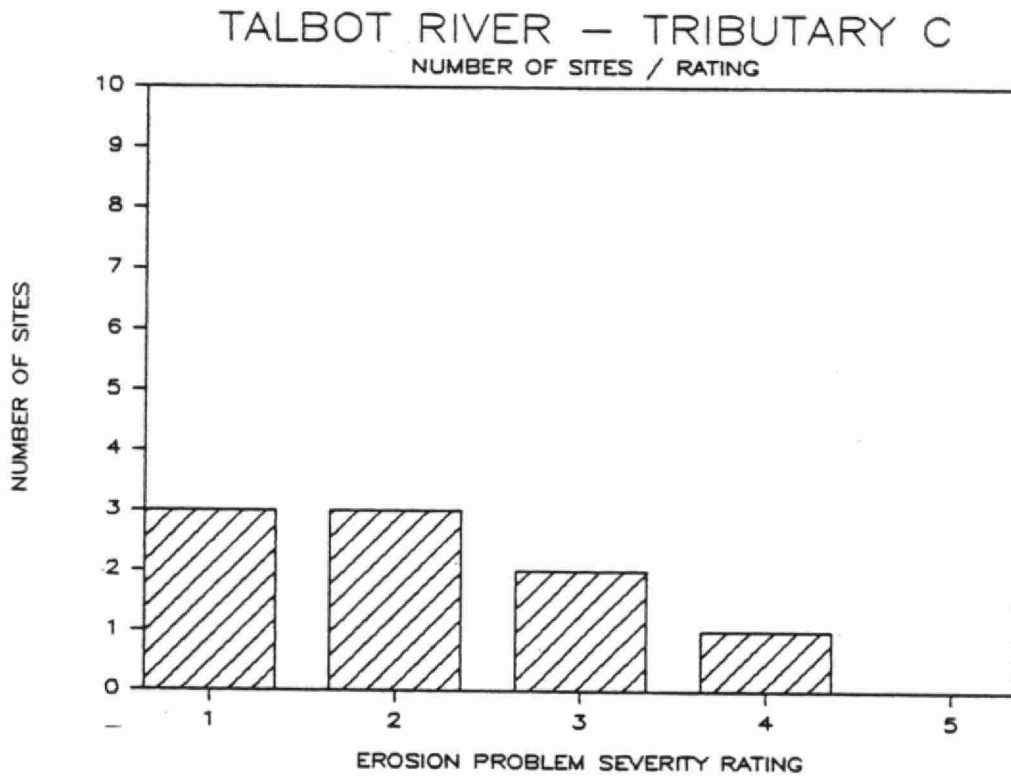


Figure 9. Number of sites per rating.

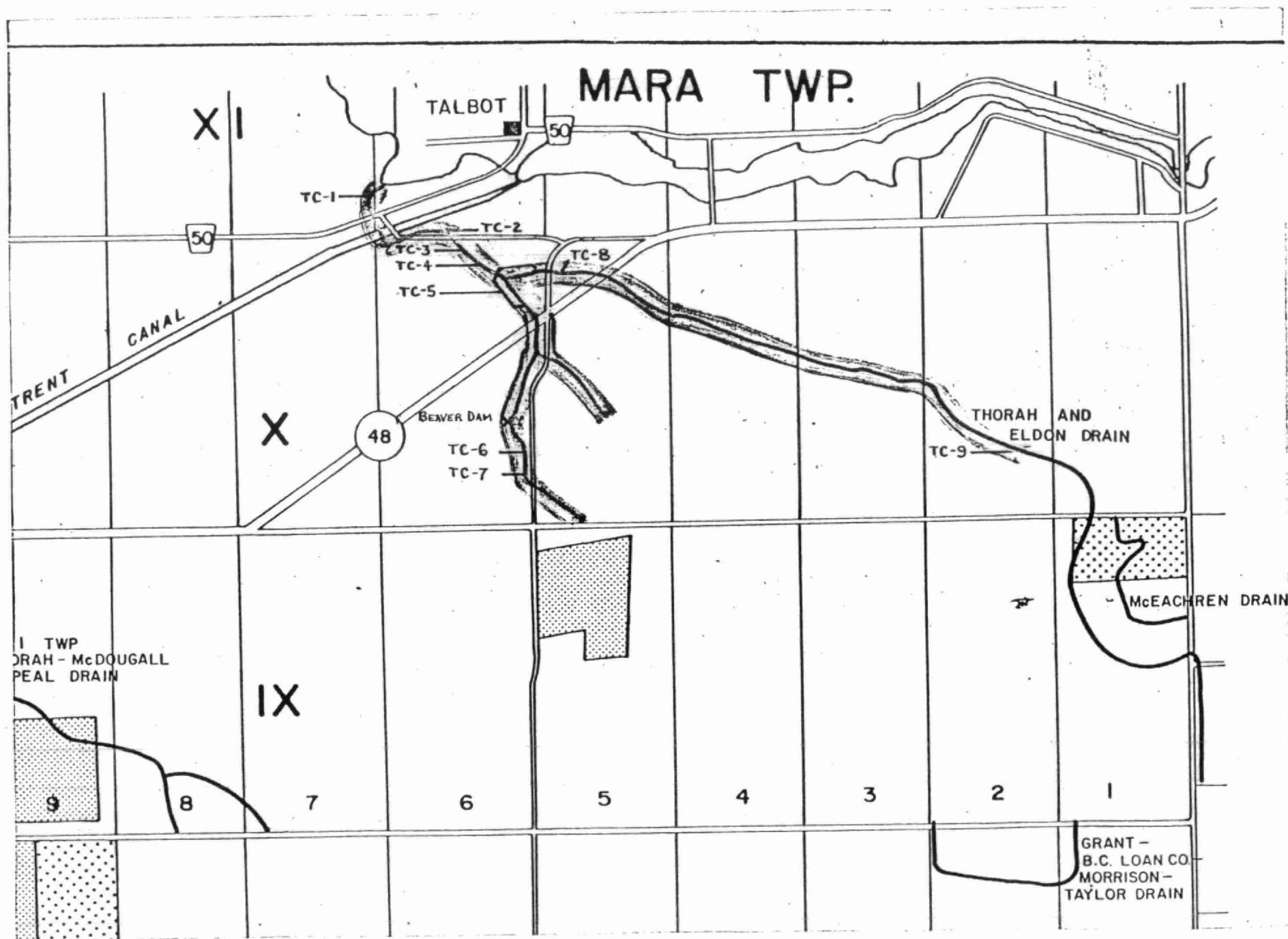


Figure 10. Location of sites. Talbot River - Tributary C.

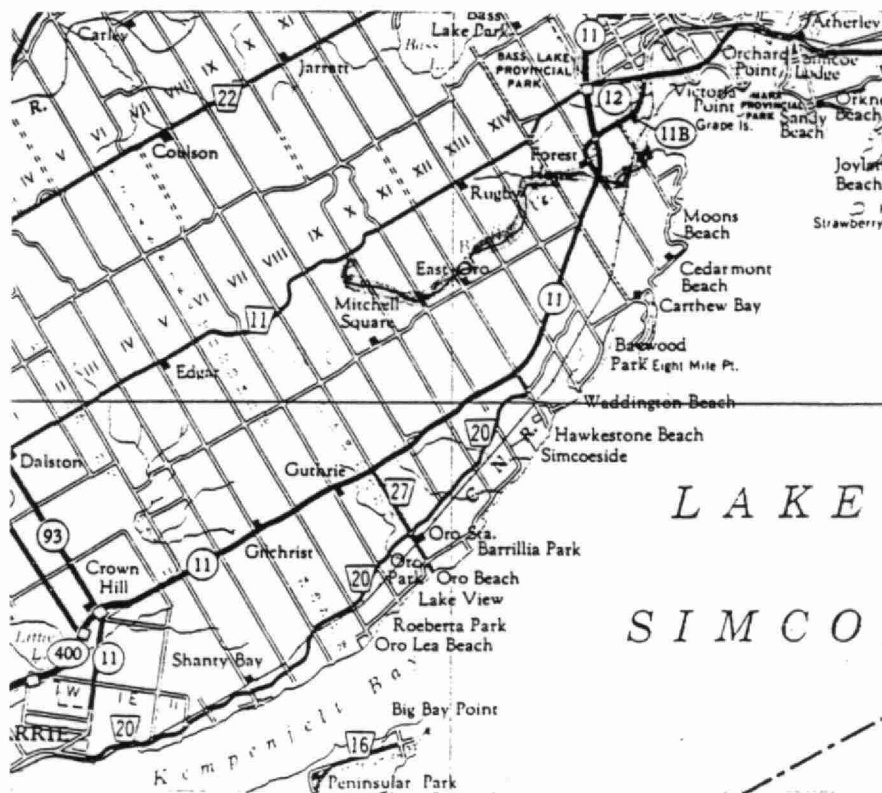
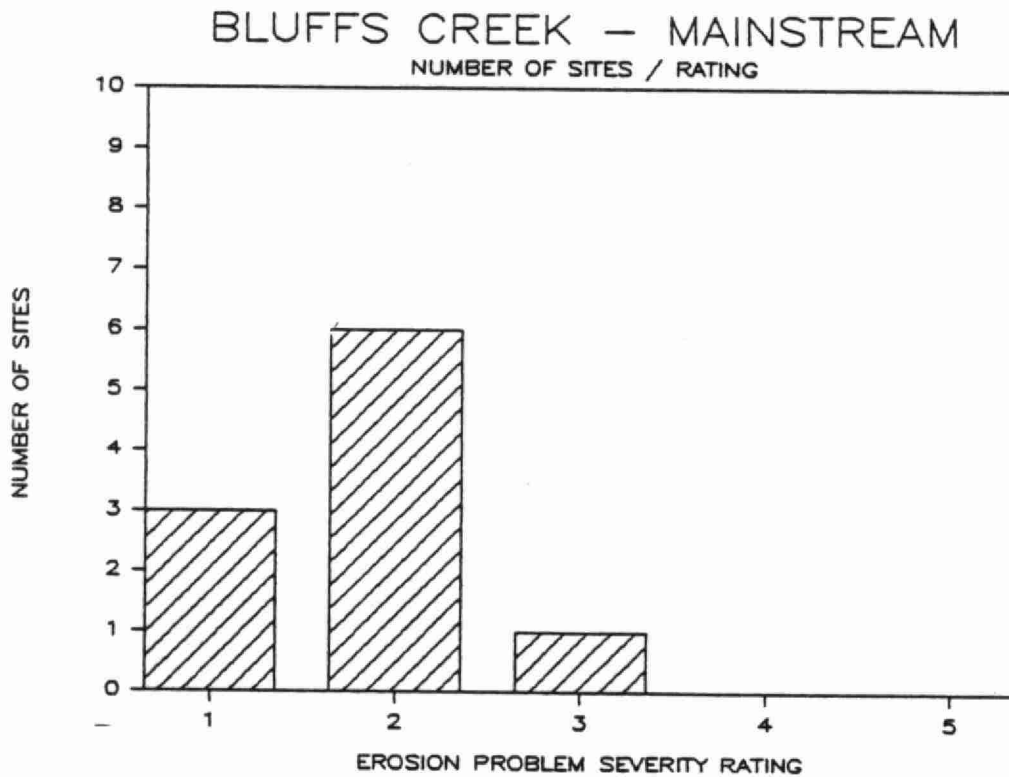


Figure 11. Number of sites per rating.

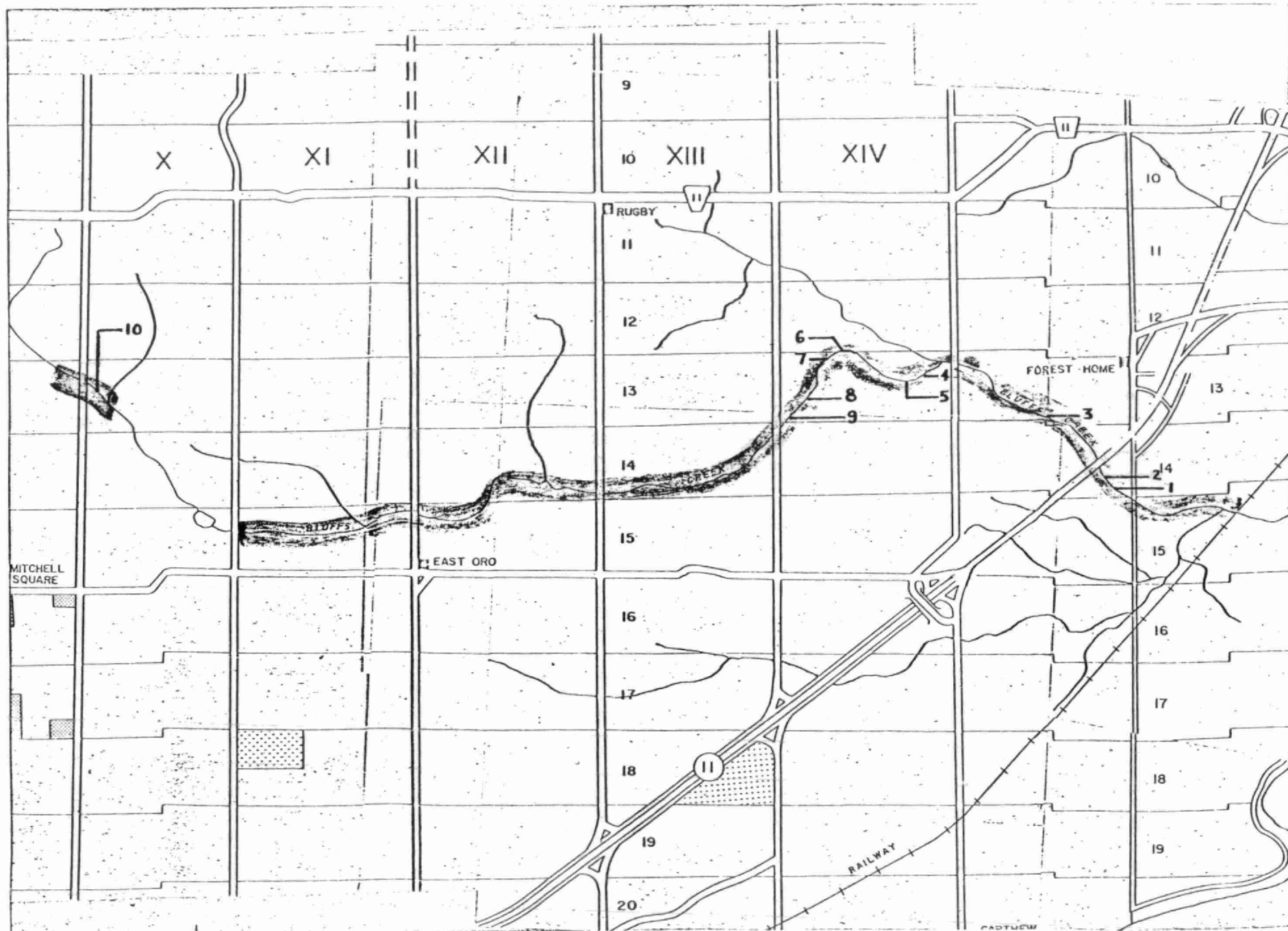


Figure 12. Location of sites. Bluffs Creek - Mainstream.

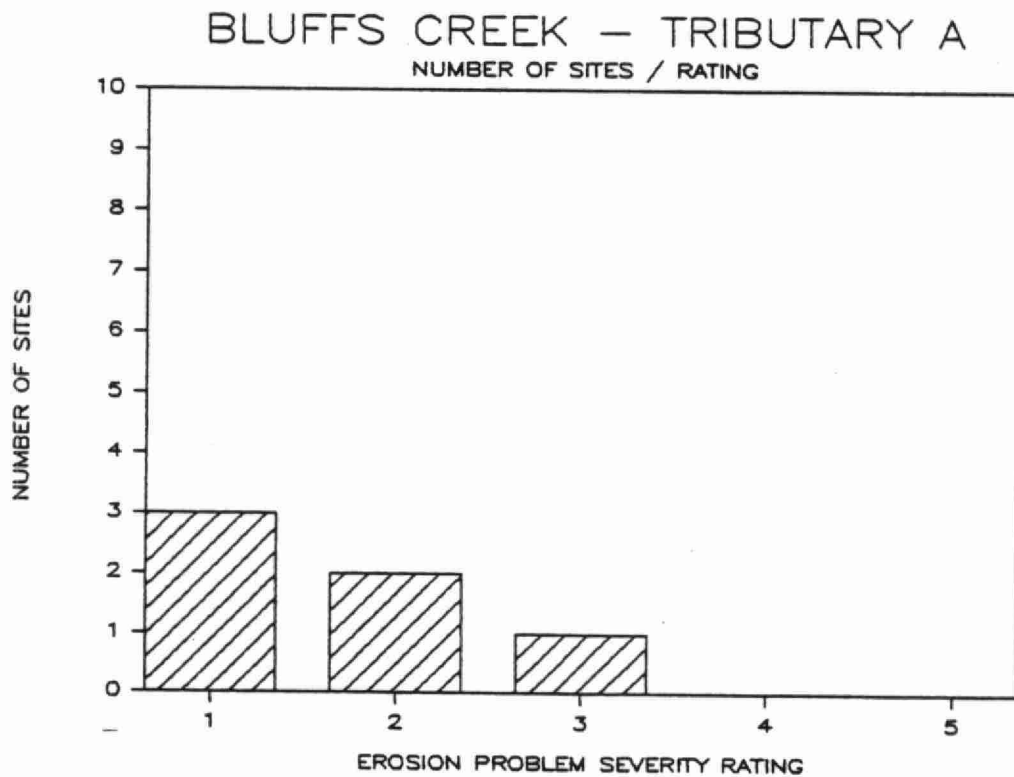


Figure 13. Number of sites per rating.

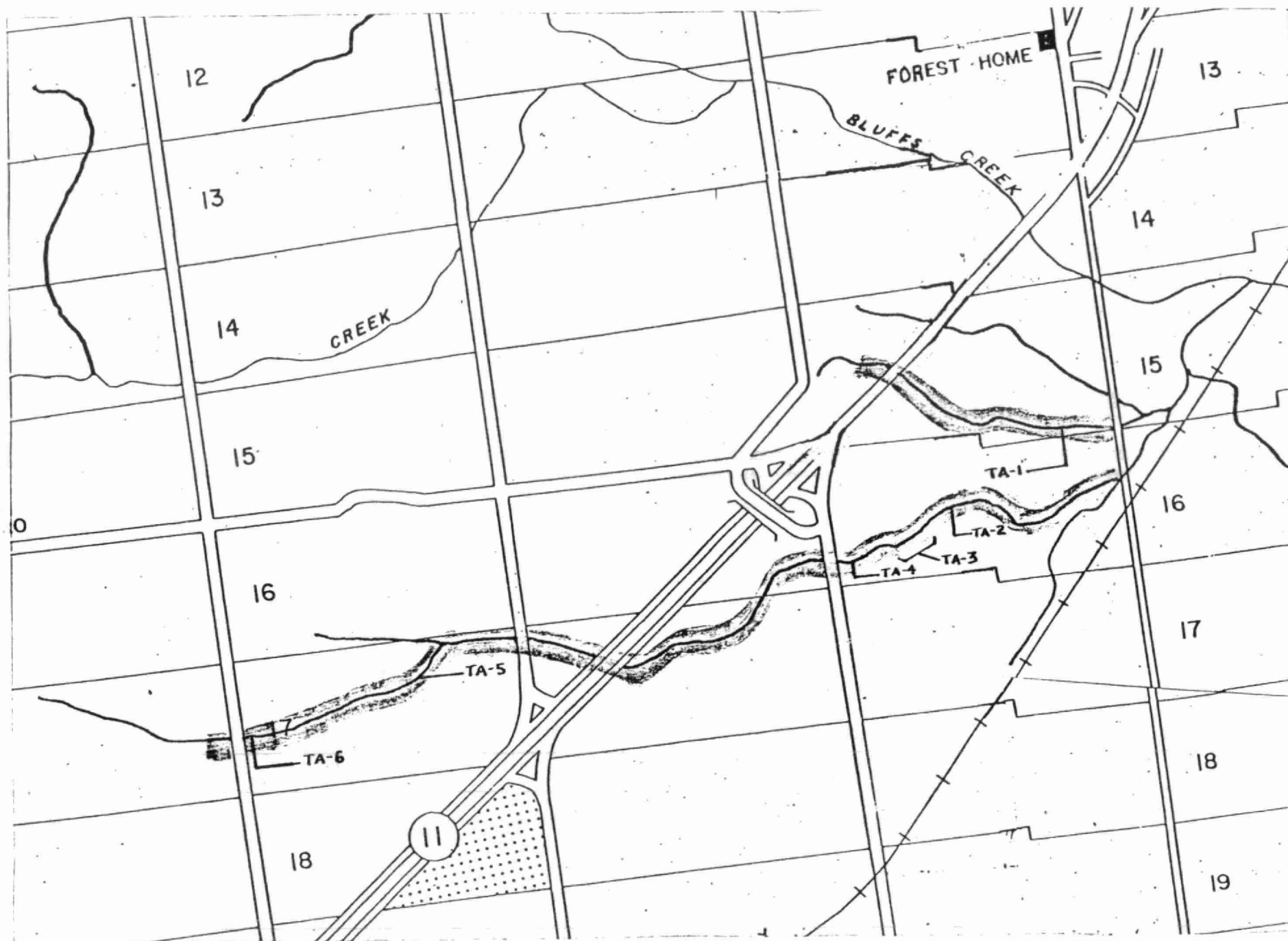


Figure 14. Location of sites. Bluffs Creek - Tributary A.

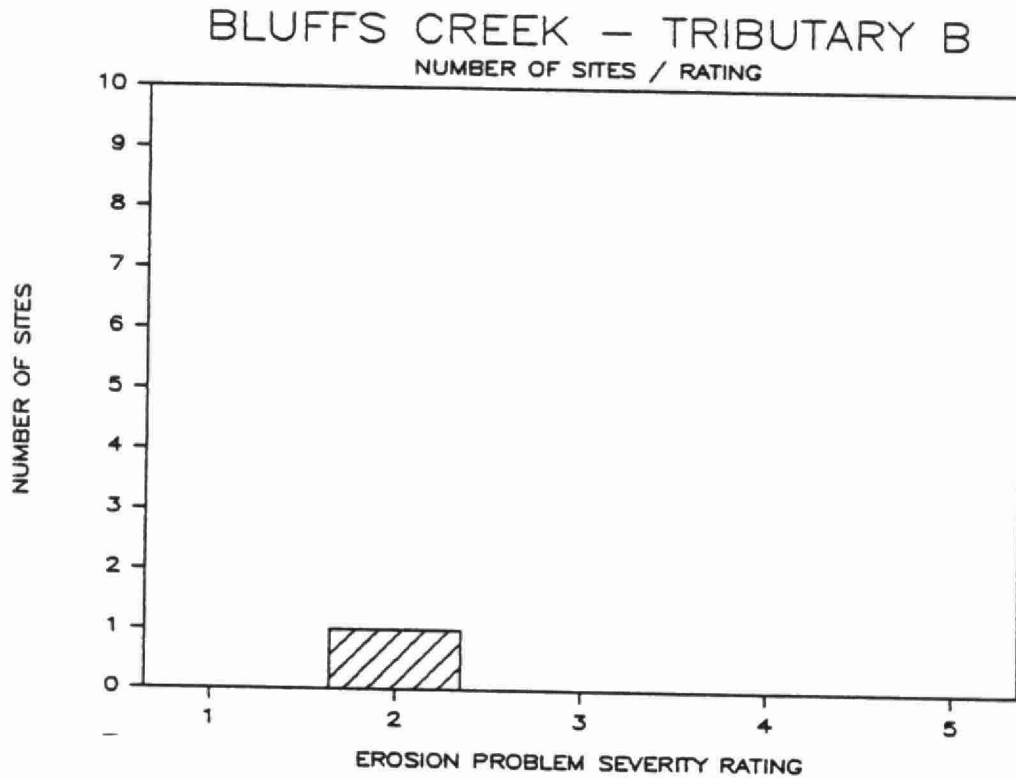


Figure 15. Number of sites per rating.

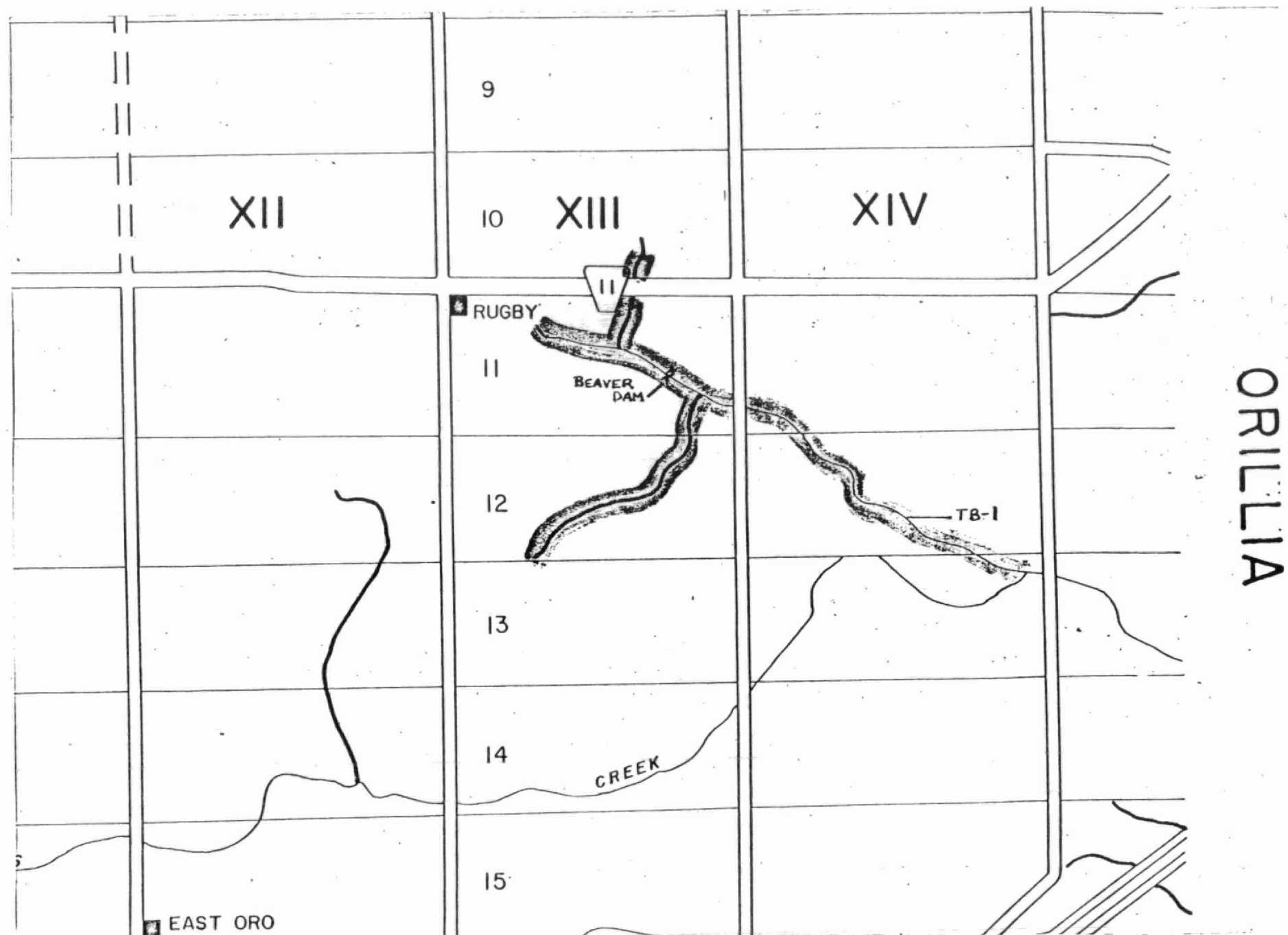


Figure 16. Location of sites. Bluffs Creek - Tributary B.

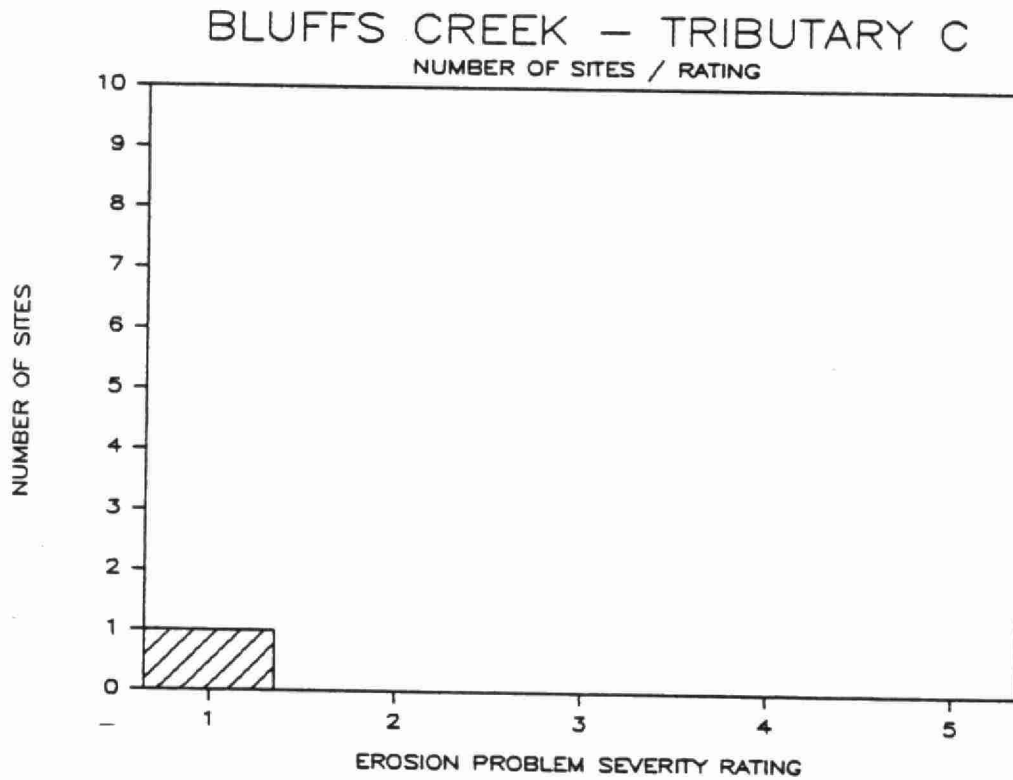


Figure 17. Number of sites per rating.

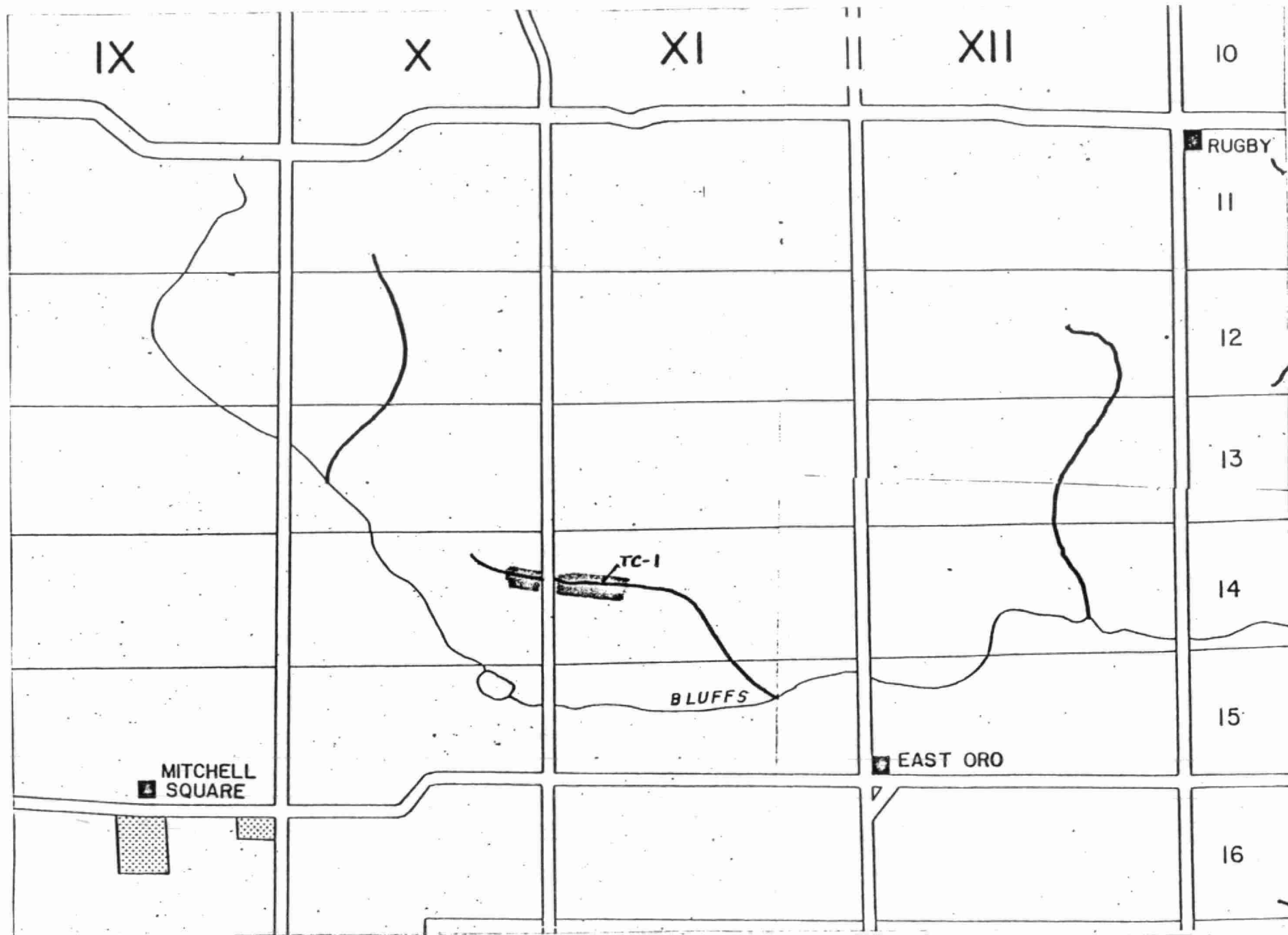


Figure 18. Location of site. Bluffs Creek - Tributary C.

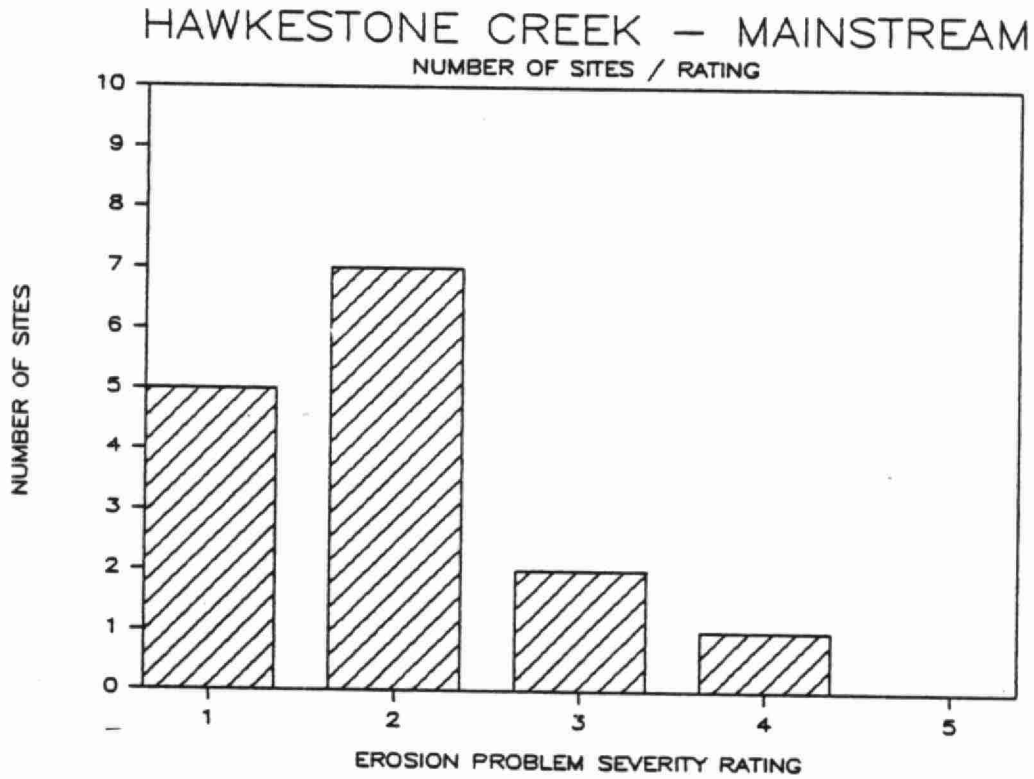


Figure 19. Number of sites per rating.

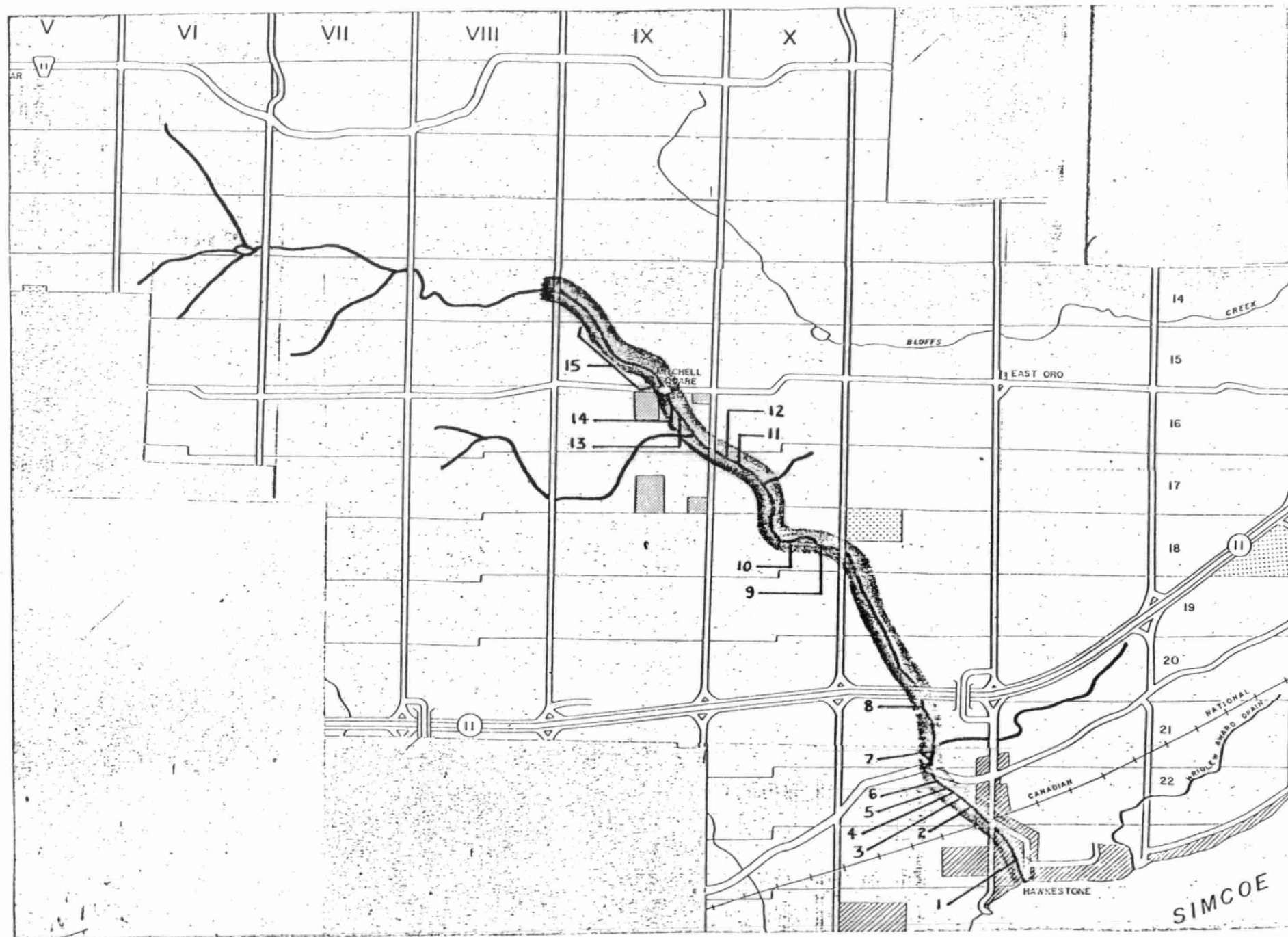


Figure 20. Location of sites. Hawkestone Creek - Mainstream.

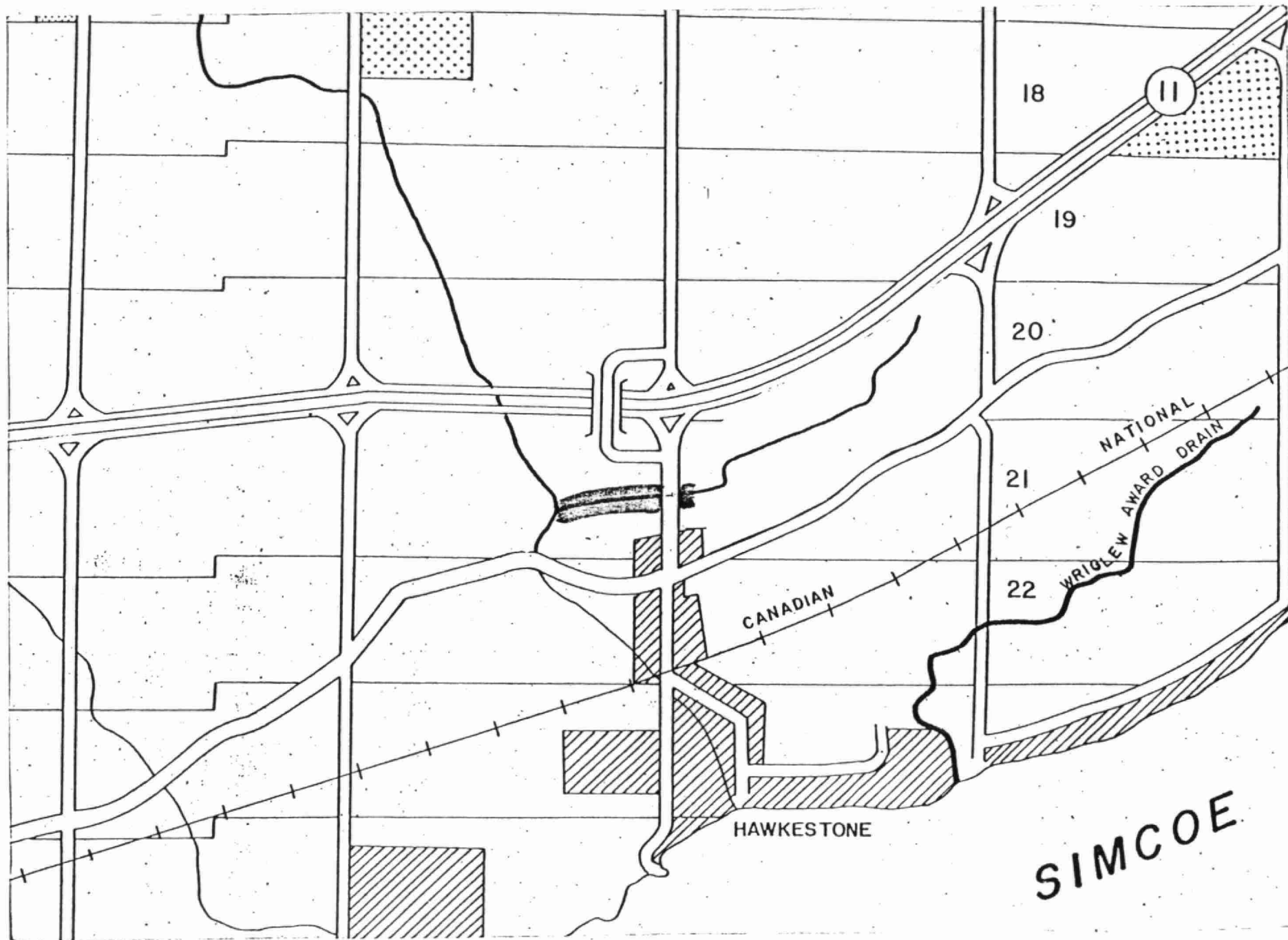


Figure 21. Hawkestone Creek - Tributary A.

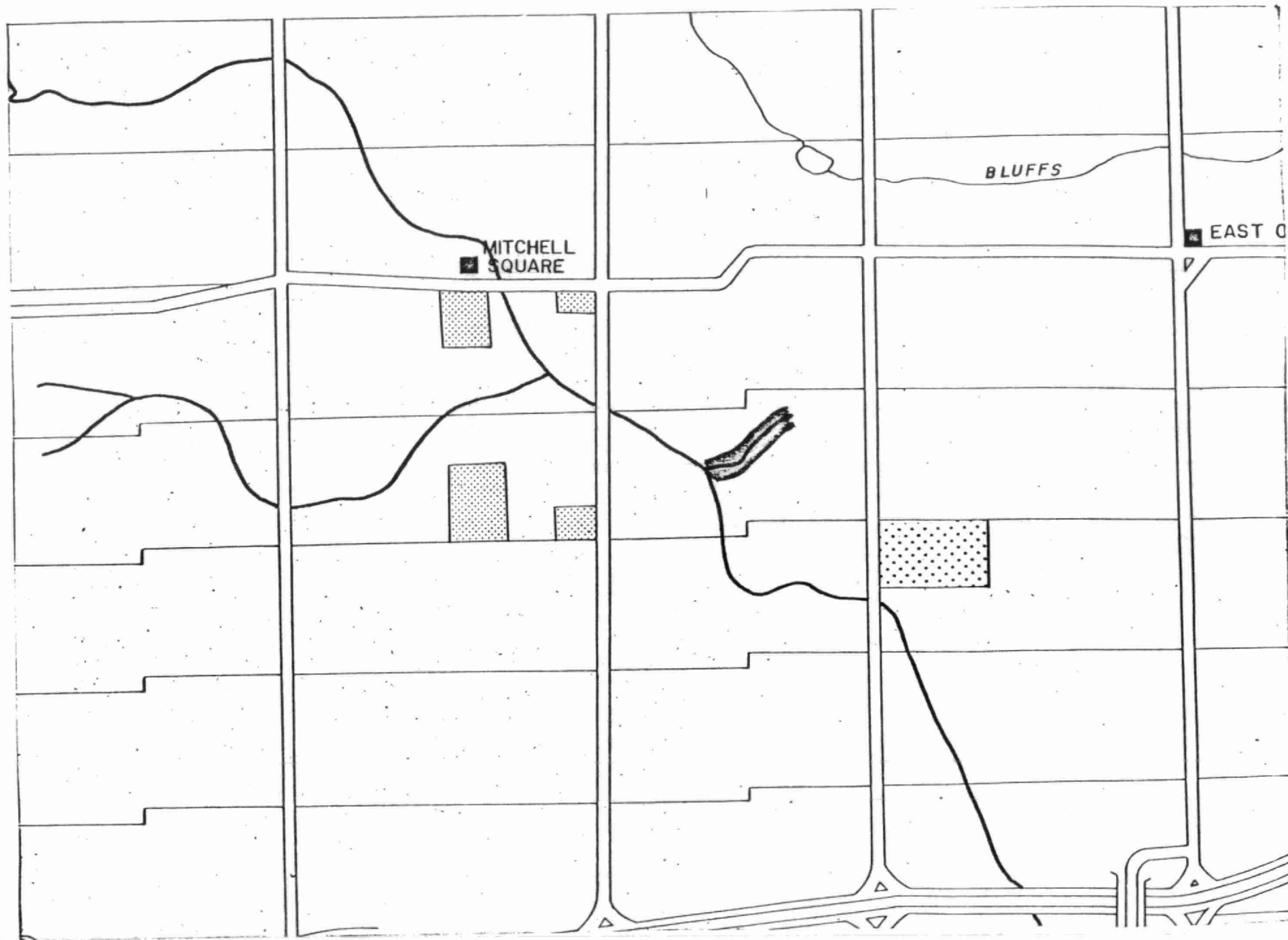


Figure 22. Hawkestone Creek - Tributary B.

HAWKESTONE CREEK - TRIBUTARY C

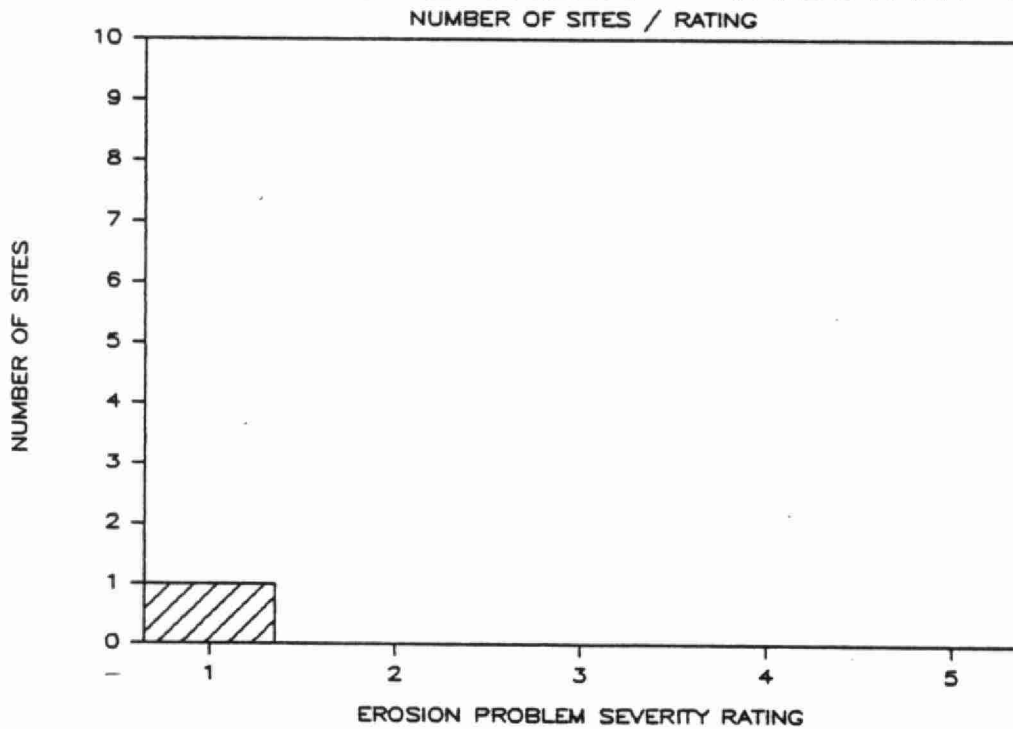


Figure 23. Number of sites per rating.



Figure 24. Location of site. Hawkestone Creek - Tributary C.

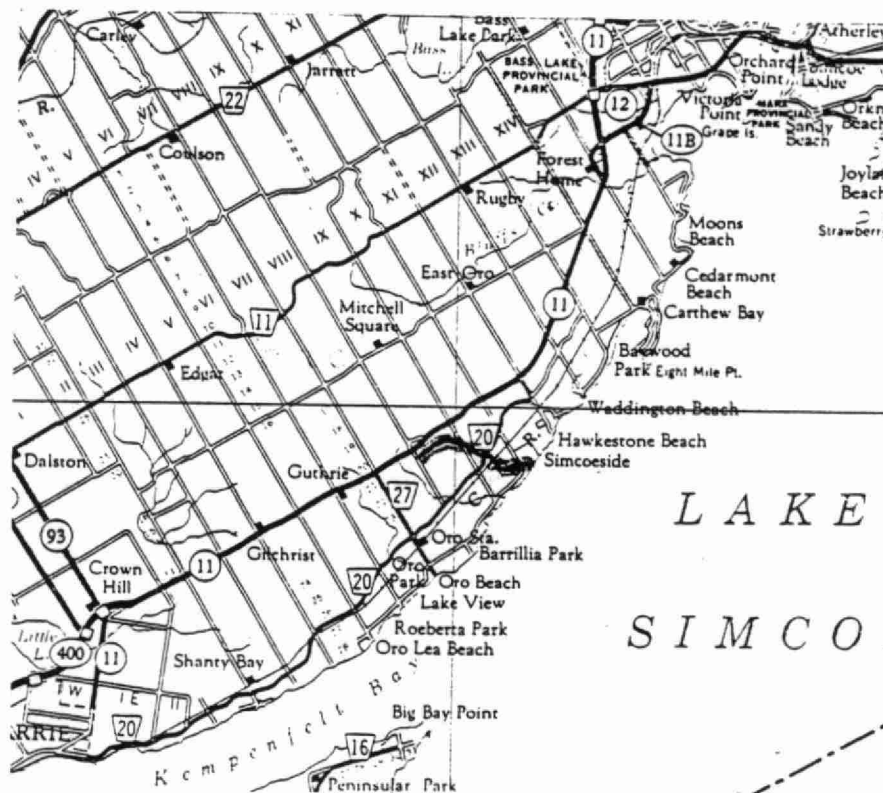
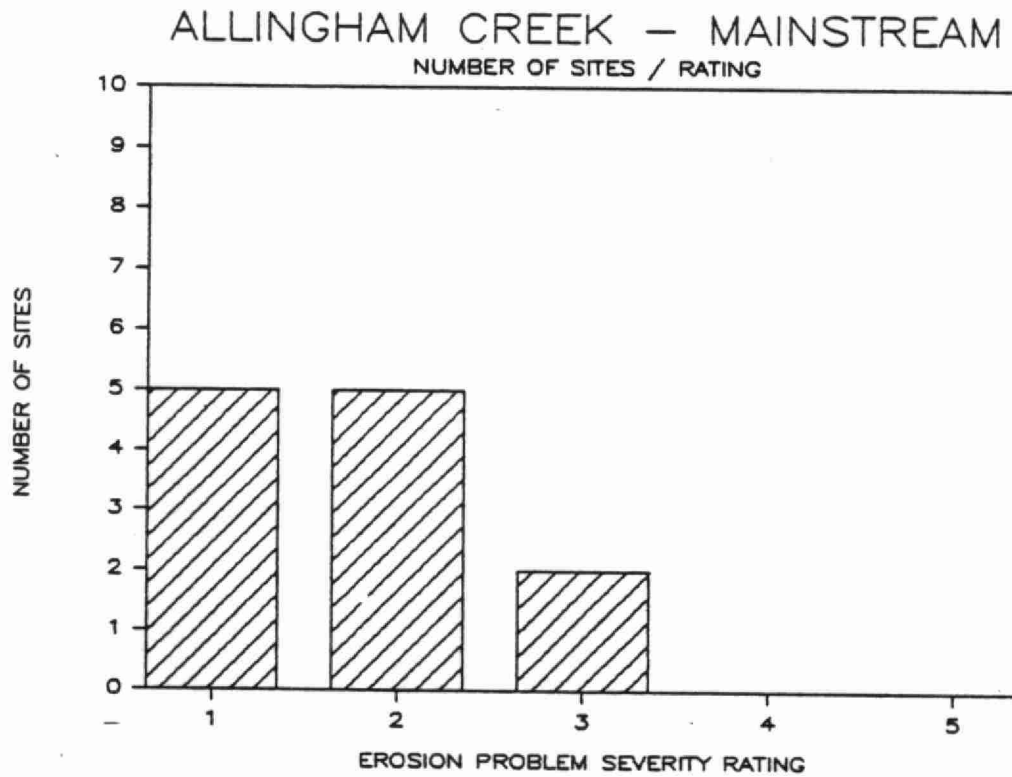


Figure 25. Number of sites per rating.

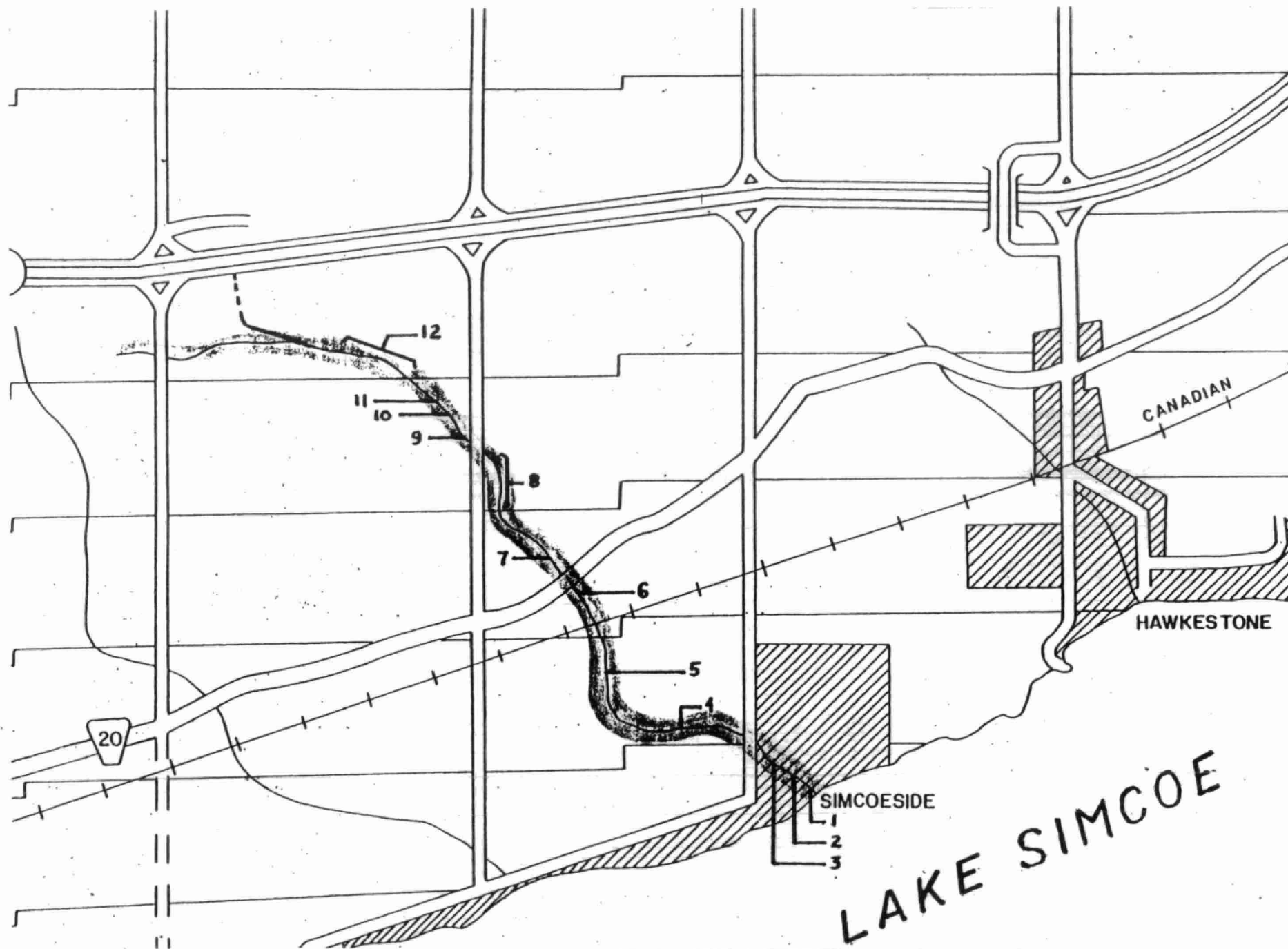


Figure 26. Location of sites. Allingham Creek - Mainstream.

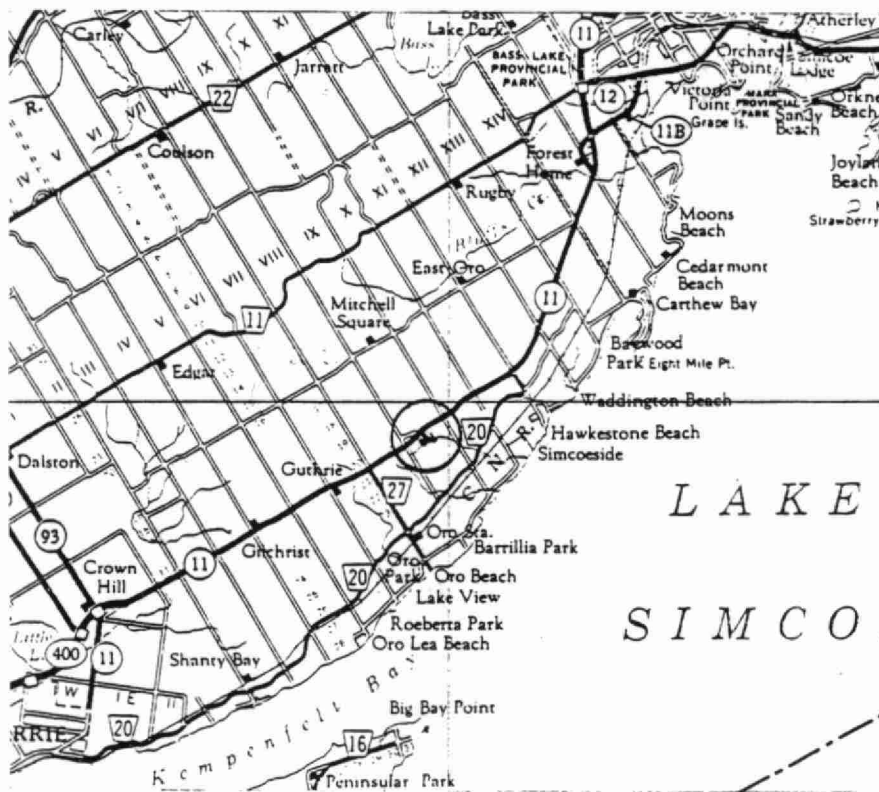
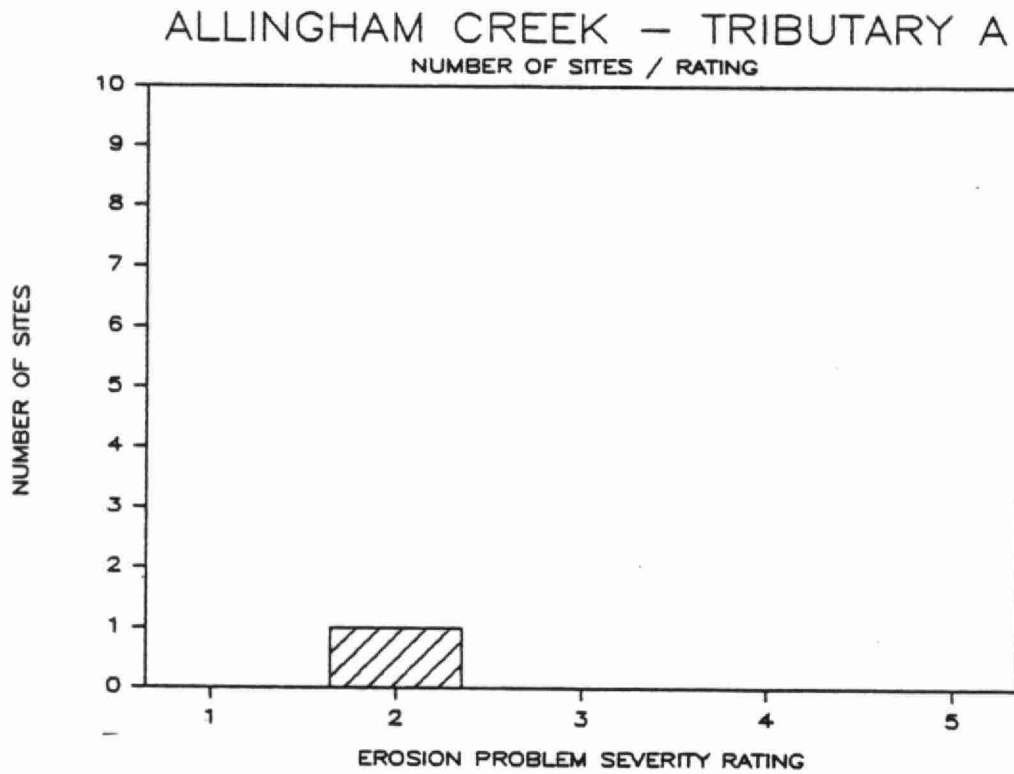


Figure 27. Number of sites per rating.

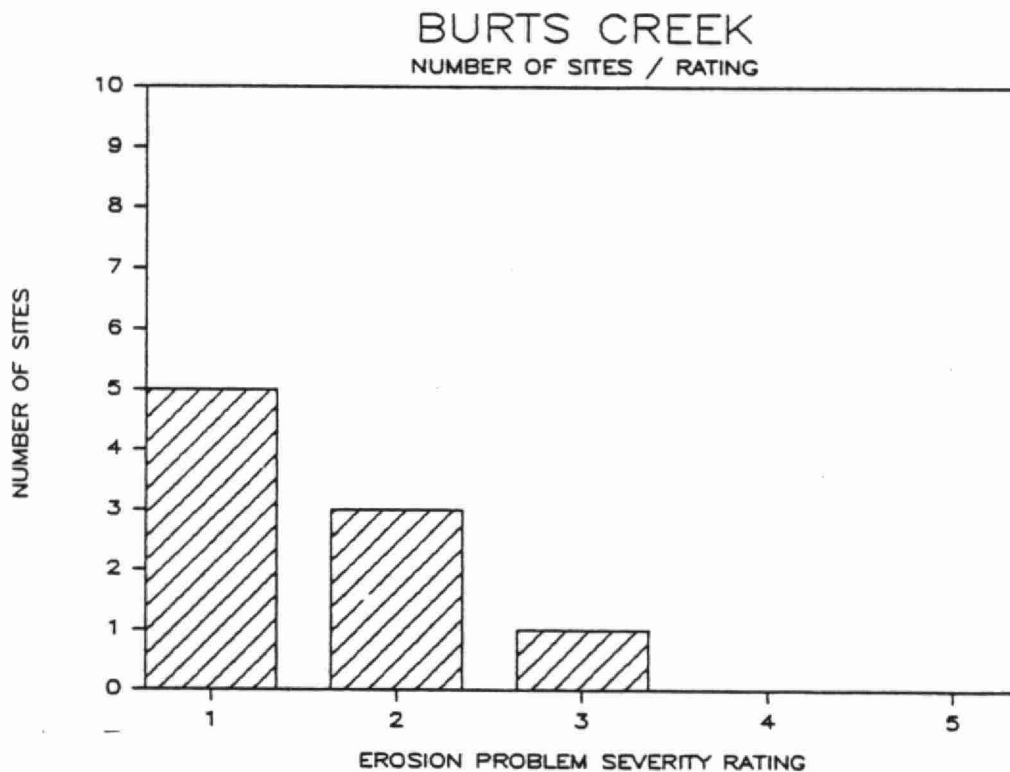


Figure 29. Number of sites per rating.

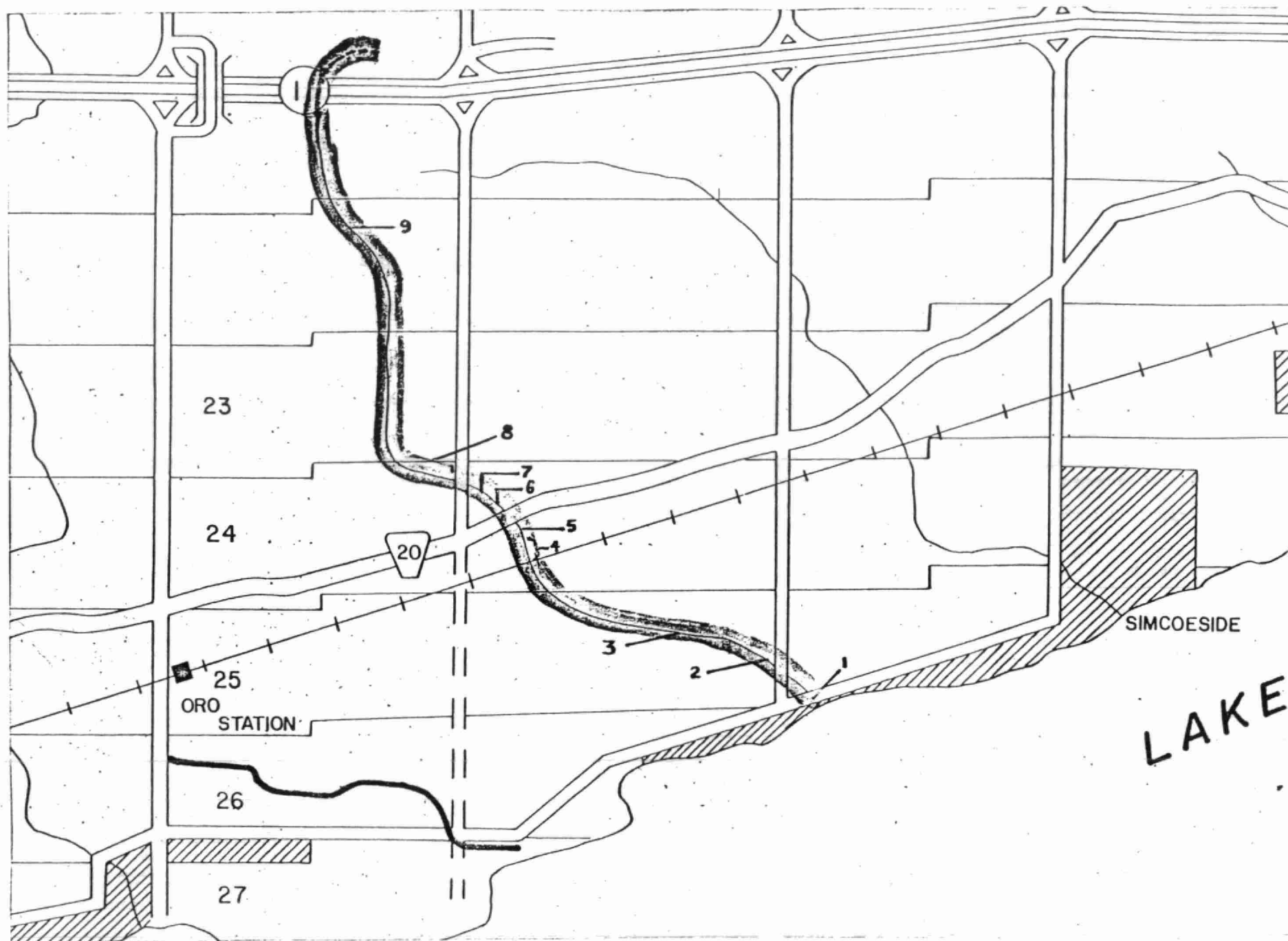


Figure 30. Location of sites. Burts Creek.

UNNAMED STREAM AT ORO BEACH: MAINSTREAM

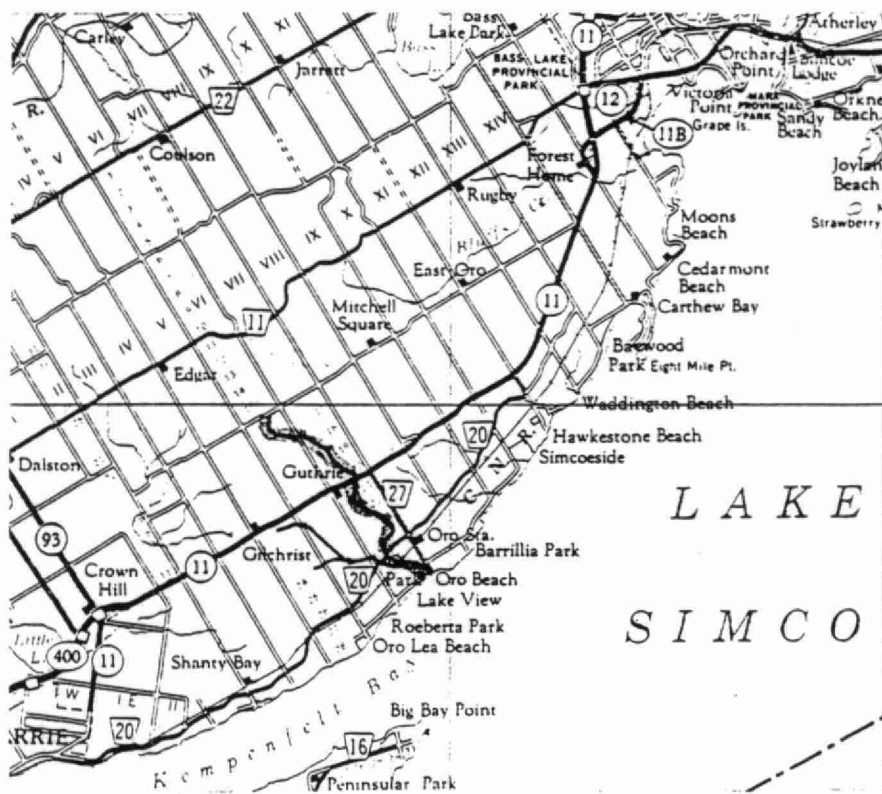
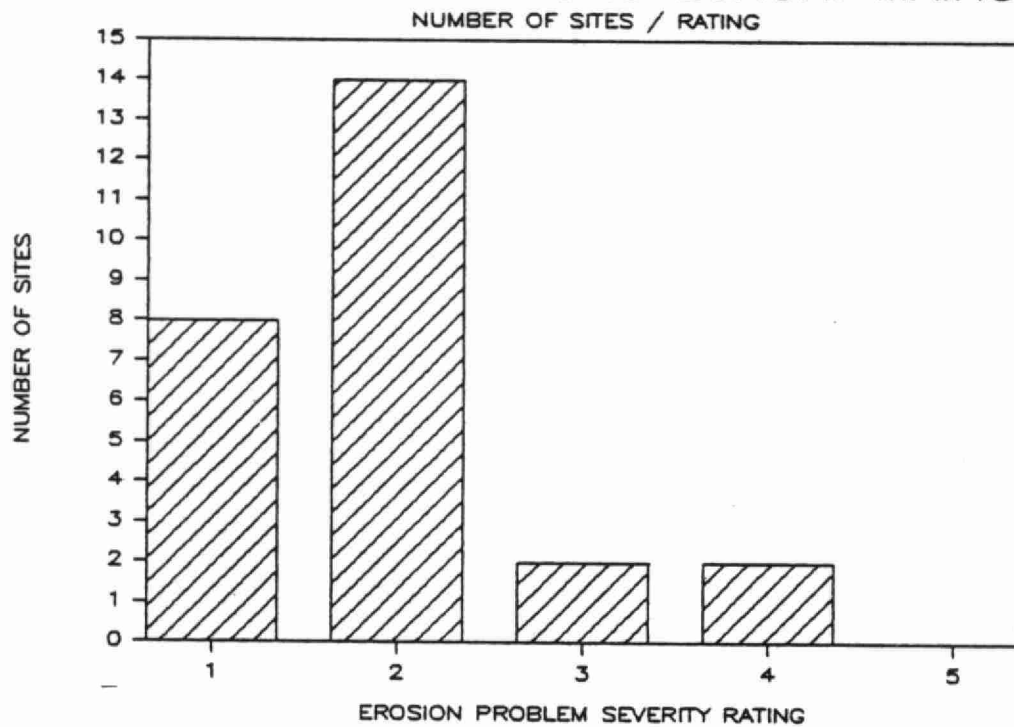


Figure 31. Number of sites per rating.

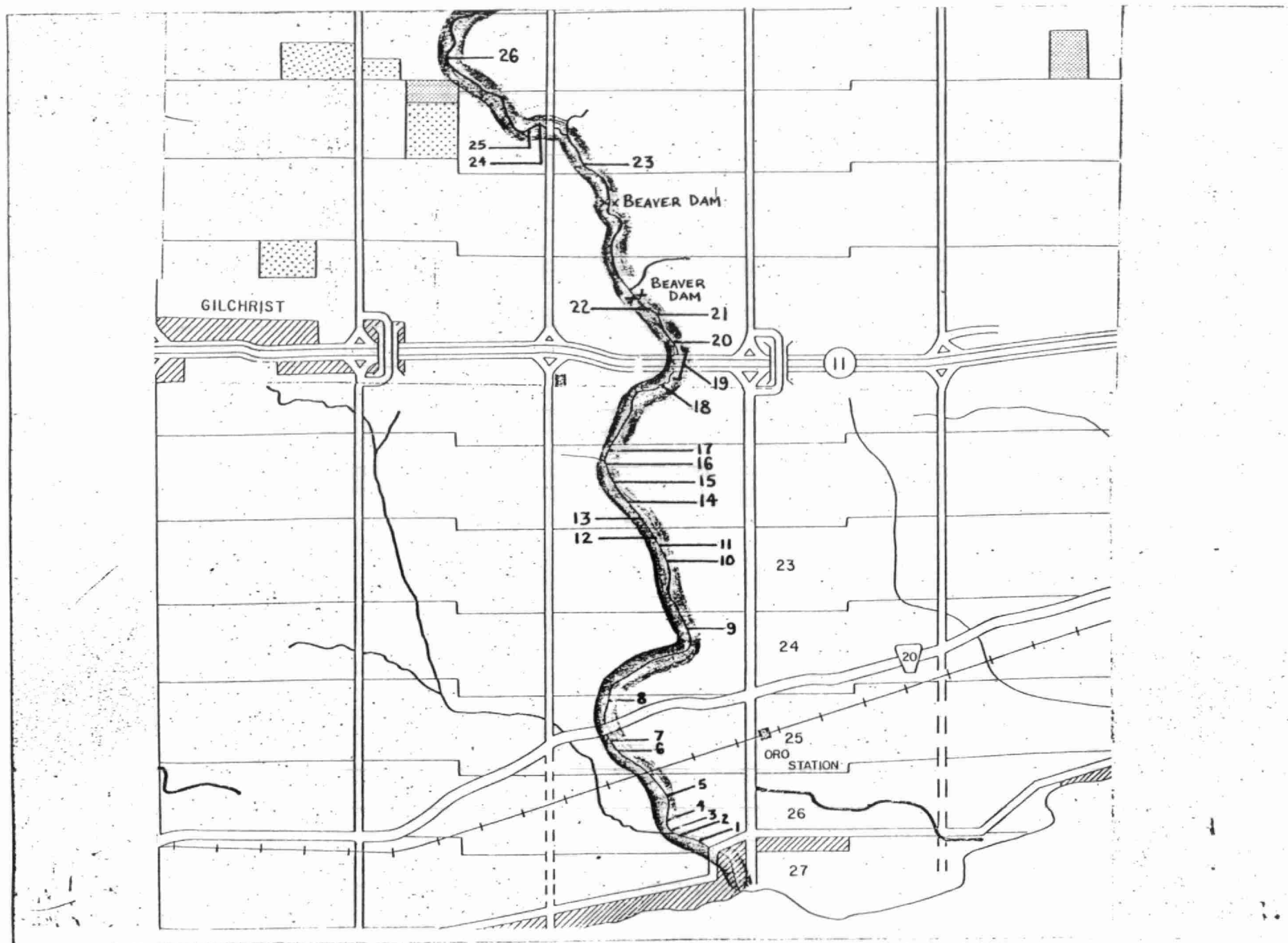


Figure 32. Location of sites. Unnamed Stream at Oro Beach - Mainstream.

UNNAMED STREAM AT ORO BEACH—TRIBUTARY A

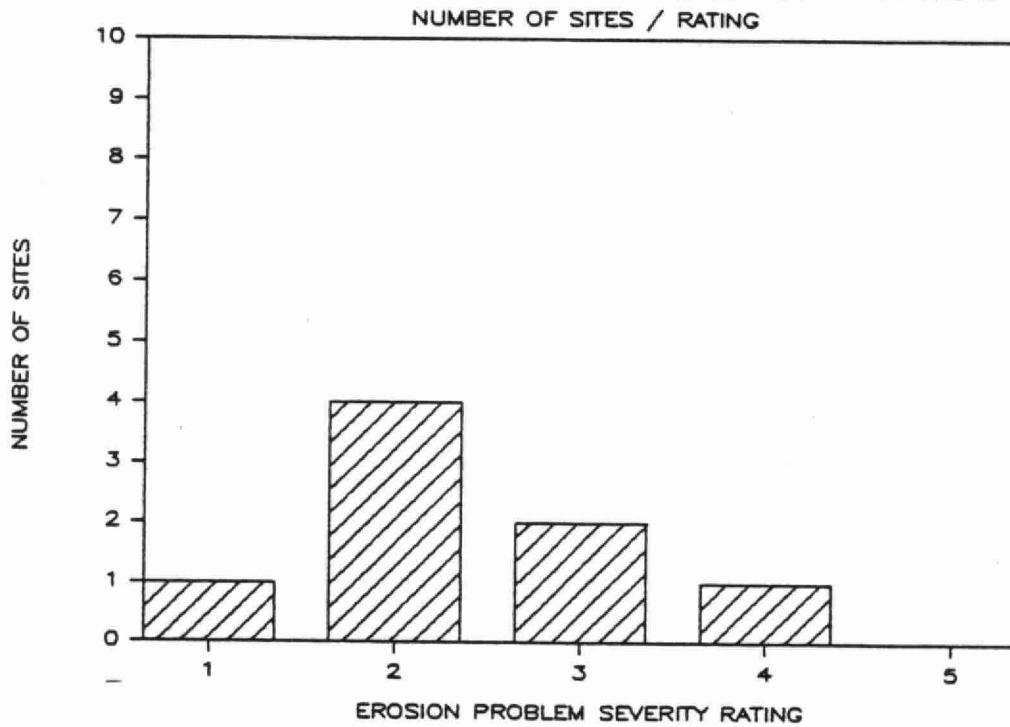


Figure 33. Number of sites per rating.

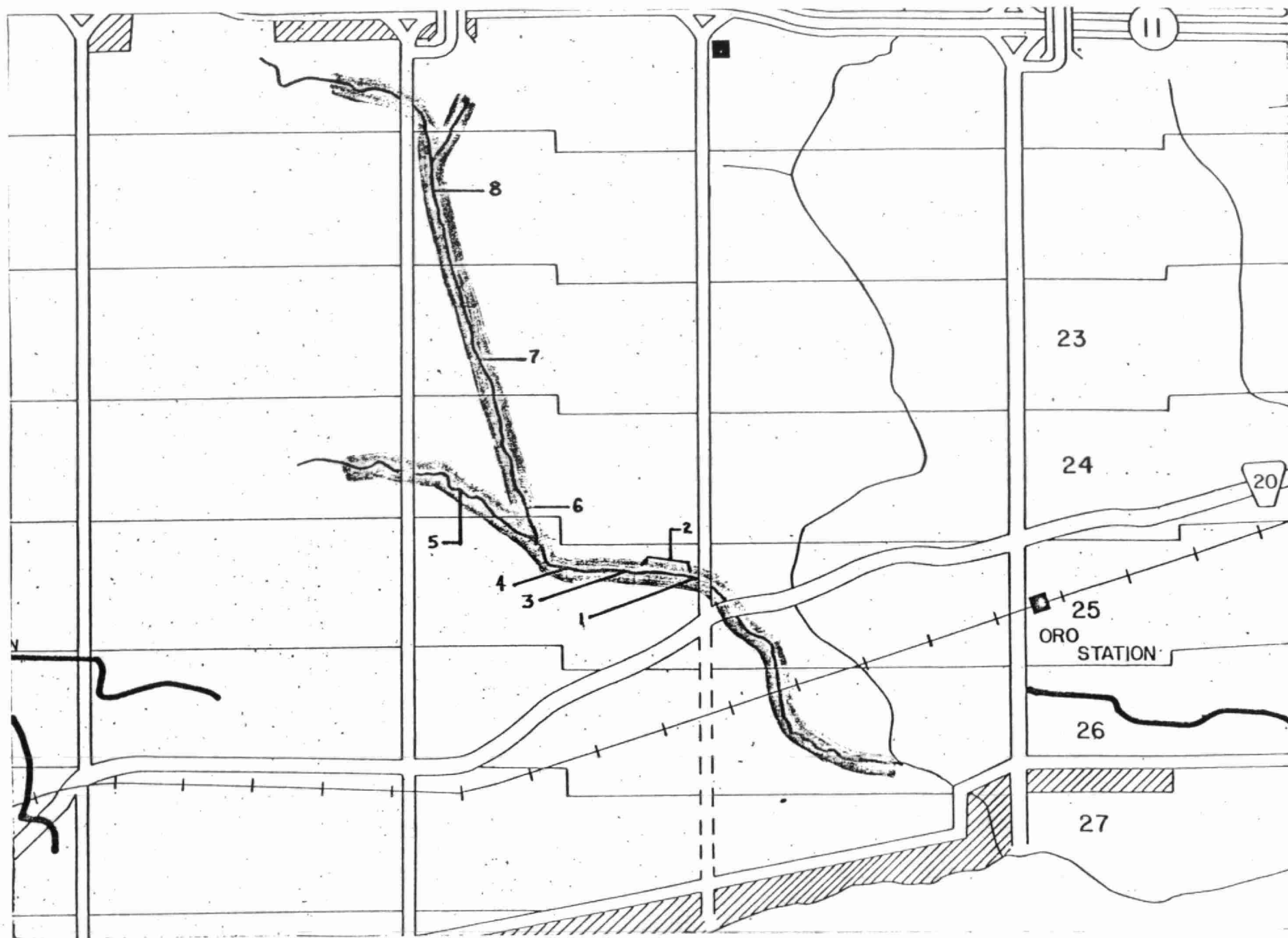


Figure 34. Location of sites. Unnamed Stream at Oro Beach - Tributary A.

Table 1
Number of sites per rating \ type
For the entire study area

+ Rating: +	1	2	3	4	5	
+ Natural Bank +						
+ Erosion +	20	40	15	8	1	84
+ Gullying +						
+ +	6	6	3	1	0	16
+ Trampling +						
+ +	6	1	5	2	0	14
+ Inappropriate +						
+ Practices +	4	5	0	0	0	9
-						
	36	52	23	11	1	Totals 123

Table 2
Number of site per rating \ type
Talbot River
Mainstream

+ Rating: +	+ 1 +	+ 2 +	+ 3 +	+ 4 +	+ 5 +	+ +
+ Natural Bank	+ +	+ +	+ +	+ +	+ +	+ +
+ Erosion	+ 0 +	+ 4 +	+ 9 +	+ 6 +	+ 1 +	+ 20 +
+ Gullyng	+ +	+ +	+ +	+ +	+ +	+ +
+ +	+ 0 +	+ 0 +	+ 0 +	+ 0 +	+ 0 +	+ 0 +
+ Trampling	+ +	+ +	+ +	+ +	+ +	+ +
+ +	+ 0 +	+ 1 +	+ 0 +	+ 0 +	+ 0 +	+ 1 +
+ Inappropriate	+ +	+ +	+ +	+ +	+ +	+ +
+ Practices	+ 0 +	+ 0 +	+ 0 +	+ 0 +	+ 0 +	+ 0 +
+ +	+ +	+ +	+ +	+ +	+ +	+ +
+ +	+ 0 +	+ 5 +	+ 9 +	+ 6 +	+ 1 +	+ Totals +
+ +	+ 0 +	+ 5 +	+ 9 +	+ 6 +	+ 1 +	+ 21 +

Table 3
Number of sites per rating \ type
Talbot River
Tributary B

+ Rating: +	+ 1 +	+ 2 +	+ 3 +	+ 4 +	+ 5 +	+ +
+ Natural Bank	+ +	+ +	+ +	+ +	+ +	+ +
+ Erosion	+ 0 +	+ 1 +	+ 0 +	+ 0 +	+ 0 +	+ 1 +
+ Gullyng	+ +	+ +	+ +	+ +	+ +	+ +
+ +	+ 0 +	+ 0 +	+ 0 +	+ 0 +	+ 0 +	+ 0 +
+ Trampling	+ +	+ +	+ +	+ +	+ +	+ +
+ +	+ 1 +	+ 0 +	+ 1 +	+ 0 +	+ 0 +	+ 2 +
+ Inappropriate	+ +	+ +	+ +	+ +	+ +	+ +
+ Practices	+ 0 +	+ 0 +	+ 0 +	+ 0 +	+ 0 +	+ 0 +
+ +	+ +	+ +	+ +	+ +	+ +	+ +
+ +	+ 1 +	+ 1 +	+ 1 +	+ 0 +	+ 0 +	+ Totals +
+ +	+ 1 +	+ 1 +	+ 1 +	+ 0 +	+ 0 +	+ 3 +

Table 4
Number of sites per rating \ type
Talbot River
Tributary C

+ Rating: +	1	2	3	4	5	
+ Natural Bank	+	+	+	+	+	+
+ Erosion	1	2	0	0	0	3
+ Gullying	+	+	+	+	+	+
+	1	1	0	0	0	2
+ Trampling	+	+	+	+	+	+
+	1	0	2	1	0	4
+ Inappropriate	+	+	+	+	+	+
+ Practices	0	0	0	0	0	0
+ Totals	3	3	2	1	0	9

Table 5
Number of sites per rating \ type
Bluffs Creek
Mainstream

+ Rating: +	1	2	3	4	5	
+ Natural Bank	+	+	+	+	+	+
+ Erosion	2	6	1	0	0	9
+ Gullying	+	+	+	+	+	+
	0	0	0	0	0	0
+ Trampling	+	+	+	+	+	+
	1	0	0	0	0	1
+ Inappropriate	+	+	+	+	+	+
+ Practices	0	0	0	0	0	0
	+	+	+	+	+	Totals
	3	6	1	0	0	10

Table 6
Number of sites per rating \ type
Bluffs Creek
Tributary A

+ Rating: +	1	2	3	4	5	
+ Natural Bank	+	+	+	+	+	+
+ Erosion	1	2	0	0	0	3
+ Gullying	+	+	+	+	+	+
	0	0	0	0	0	0
+ Trampling	+	+	+	+	+	+
	1	0	1	0	0	2
+ Inappropriate	+	+	+	+	+	+
+ Practices	1	0	0	0	0	1
	+	+	+	+	+	Totals
	3	2	1	0	0	6

Table 7
Number of sites per rating \ type
Bluffs Creek
Tributary B

+ Rating:	+ 1	+ 2	+ 3	+ 4	+ 5	
+ Natural Bank	+	+	+	+	+	+
+ Erosion	+ 0	+ 1	+ 0	+ 0	+ 0	+ 1
+ Gullying	+	+	+	+	+	+
+	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0
+ Trampling	+	+	+	+	+	+
+	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0
+ Inappropriate	+	+	+	+	+	+
+ Practices	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0
	+	+	+	+	+	+ Totals
	+ 0	+ 1	+ 0	+ 0	+ 0	+ 1

Table 8
Number of sites per rating \ type
Bluffs Creek
Tributary C

+ Rating:	+ 1	+ 2	+ 3	+ 4	+ 5	
+ Natural Bank	+	+	+	+	+	+
+ Erosion	+ 1	+ 0	+ 0	+ 0	+ 0	+ 1
+ Gullying	+	+	+	+	+	+
+	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0
+ Trampling	+	+	+	+	+	+
+	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0
+ Inappropriate	+	+	+	+	+	+
+ Practices	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0
	+	+	+	+	+	+ Totals
	+ 1	+ 0	+ 0	+ 0	+ 0	+ 1

Table 9
Number of sites per rating \ type
Hawkestone Creek
Mainstream

+ Rating:	+ 1	+ 2	+ 3	+ 4	+ 5	
+ Natural Bank	+	+	+	+	+	+
+ Erosion	+ 5	+ 6	+ 1	+ 0	+ 0	+ 12
+ Gullying	+	+	+	+	+	+
+	+ 0	+ 0	+ 1	+ 0	+ 0	+ 1
+ Trampling	+	+	+	+	+	+
+	+ 0	+ 0	+ 0	+ 1	+ 0	+ 1
+ Inappropriate	+	+	+	+	+	+
+ Practices	+ 0	+ 1	+ 0	+ 0	+ 0	+ 1
-	+	+	+	+	+	Totals
	+ 5	+ 7	+ 2	+ 1	+ 0	+ 15

Table 10
Number of sites per rating \ type
Hawkestone Creek
Tributary C

+ Rating:	+ 1	+ 2	+ 3	+ 4	+ 5	
+ Natural Bank	+	+	+	+	+	+
+ Erosion	+ 1	+ 0	+ 0	+ 0	+ 0	+ 1
+ Gullying	+	+	+	+	+	+
+	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0
+ Trampling	+	+	+	+	+	+
+	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0
+ Inappropriate	+	+	+	+	+	+
+ Practices	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0
	+	+	+	+	+	Totals
	+ 1	+ 0	+ 0	+ 0	+ 0	+ 1

Table 11
Number of sites per rating \ type
Allingham Creek
Mainstream

+ Rating: +	1	2	3	4	5	
+ Natural Bank	+	+	+	+	+	+
+ Erosion	3	4	2	0	0	9
+ Gullying	+	+	+	+	+	+
+	2	0	0	0	0	2
+ Trampling	+	+	+	+	+	+
+	0	0	0	0	0	0
+ Inappropriate	+	+	+	+	+	+
+ Practices	0	1	0	0	0	1
-	+	+	+	+	+	+ Totals +
	5	5	2	0	0	12

Table 12
Number of sites per rating \ type
Allingham Creek
Tributary A

+ Rating: +	1	2	3	4	5	
+ Natural Bank	+	+	+	+	+	+
+ Erosion	0	0	0	0	0	0
+ Gullying	+	+	+	+	+	+
+	0	0	0	0	0	0
+ Trampling	+	+	+	+	+	+
+	0	0	0	0	0	0
+ Inappropriate	+	+	+	+	+	+
+ Practices	0	1	0	0	0	1
	+	+	+	+	+	+ Totals +
	0	1	0	0	0	1

Table 13
Number of sites per rating \ type
Burts Creek

+ Rating: +	1	2	3	4	5	
+ Natural Bank	+	+	+	+	+	+
+ Erosion	3	3	1	0	0	7
+ Gullying	+	+	+	+	+	+
+	0	0	0	0	0	0
+ Trampling	+	+	+	+	+	+
+	2	0	0	0	0	2
+ Inappropriate	+	+	+	+	+	+
+ Practices	0	0	0	0	0	0
+ Totals	5	3	1	0	0	9

Table 14
Number of sites per rating \ type
Unnamed Stream at Oro Beach
Mainstream

+ Rating: +	1	+ 2	+ 3	+ 4	+ 5	+
+ Natural Bank	+	+	+	+	+	+
+ Erosion	+ 2	+ 8	+ 0	+ 2	+ 0	+ 12
+ Gullying	+	+	+	+	+	+
+	+ 3	+ 5	+ 1	+ 0	+ 0	+ 9
+ Trampling	+	+	+	+	+	+
+	+ 0	+ 0	+ 1	+ 0	+ 0	+ 1
+ Inappropriate	+	+	+	+	+	+
+ Practices	+ 3	+ 1	+ 0	+ 0	+ 0	+ 4
+	+	+	+	+	+	+
+	+ 8	+ 14	+ 2	+ 2	+ 0	+ 26
+	+	+	+	+	+	+

Table 15
Number of sites per rating \ type
Unnamed Stream at Oro Beach
Tributary A

+ Rating: +	1	+ 2	+ 3	+ 4	+ 5	+
+ Natural Bank	+	+	+	+	+	+
+ Erosion	+ 1	+ 3	+ 1	+ 0	+ 0	+ 5
+ Gullying	+	+	+	+	+	+
+	+ 0	+ 0	+ 1	+ 1	+ 0	+ 2
+ Trampling	+	+	+	+	+	+
+	+ 0	+ 0	+ 0	+ 0	+ 0	+ 0
+ Inappropriate	+	+	+	+	+	+
+ Practices	+ 0	+ 1	+ 0	+ 0	+ 0	+ 1
+	+	+	+	+	+	+
+	+ 1	+ 4	+ 2	+ 1	+ 0	+ 8
+	+	+	+	+	+	+

APPENDIX A

DATA SHEET

Streambank Erosion Inventory Data Sheet

Watercourse _____ Main Stream _____
 _____ Tributary _____

Date _____ Time _____
 Site # _____

1. Stream
 Width _____ Maximum Depth _____

2. Bank
 Height _____ Angle _____
 Coverage (%) _____ Trees _____
 _____ Grasses _____
 _____ Shrubs, Bushes _____
 _____ Reeds, Sedges _____

3. Adjacent Area
 Row Crop _____ Fallow _____ Scrub _____
 Grains _____ Wooded _____ Swamp _____
 Pasture _____ Residential _____ Barren _____

4. Problem Description
 Slumping/Undercutting _____ Length _____
 Gullyng _____ Depth _____

Cattle Access/Trampling _____
 Feedlot or Manure _____ Distance from stream _____

Dumping or Regrading _____
 Tile or Other Outlets _____

Obstruction: Trees/logs _____ Rocks _____ Dam/weir _____

Culvert: CSP _____ Diameter _____
 CSPA _____ Height _____
 Box _____ Width _____
 Bridge _____ Length _____

5. Erosion
 Extent: Minor 1 2 3 4 5 Severe
 Height on bank _____
 Length on shoreline _____

6. Photo # _____

7. Remedial Measure _____

8. Additional Comments/Diagram:

APPENDIX B

SITE IDENTIFICATION SYSTEM,
PROPOSED REMEDIAL MEASURES,
AND SITE DESCRIPTIONS

Site Identification System

The first letter-number combination refers to the orthophotographic record of the site locations (on file at the Conservation Authority Office). The letter prefix denotes orthophotographs from:

- O - Oro Waterfront Study,
- OE - North Oro Official Plan Study.

Where orthophotographic coverage of the area is unavailable, use of a National Topographic System map used is indicated by TOPO.

The second letter-number sequence is the date that the site was visited and catalogued. The letters refer to:

- M - May,
- J - June,

The next portion of the code is either a site number, a sector number (for a main stream) or a group of letters (for the tributaries of the stream). If length warrants, the main stream is divided into sectors that are numbered from the mouth to the headwaters. Tributaries are also lettered as they are encountered from the mouth to the headwaters.

If the location requires a sector number or a tributary identifier, the next number is the site number.

The last letter(s) refer to the bank(s) of the watercourse on which the site is located. For the purpose of assigning east or west, it is assumed that all streams flow south.

Example: TOPO-J18-1-1-EW

The site is mapped on a copy of a NTS map.

The site was catalogued on June 18, 1984.

The site is found in sector #1.

The site is the first site in the sector.

The erosion problem affects both banks of the stream.

Proposed Remedial Measures

The purpose of the recommendations that follow each site description is reduced streambank erosion. It is stressed that selecting the most appropriate control measure for an erosion site requires a detailed individual site investigation. It is necessary to determine all of the causes of the problem and the possible consequences of any implementation. Application of an inappropriate remedial measure may fail to correct the problem and may even aggravate it.

A possible consequence of major concern is the loss of fish habitat. Instream obstructions and undercut banks can be causes of streambank erosion as well as valuable fish habitat. Provisions should be made for the creation of alternate habitat in all plans which call for the removal of instream obstructions or the regrading of streambanks. The possibilities for creating or improving habitat should be a priority whenever streambank erosion control measures are contemplated.

Talbot River - Mainstream

TOPO-J18-1-1-EW

(rating 2)

This site is characterized by undercutting on meander bends for a 12 m stretch of shoreline. The area adjacent to the 13 m wide, 2 m deep river is wooded with cedar and some hardwood. The 1.5 m banks form a 90 degree angle with the river surface. Many trees have fallen into the river as a result of the erosion.

Recommendation: Clear the trees from the river. Install log riprap.

TOPO-J18-1-2-EW

(rating 2)

Natural undercutting on meander bends affects all of the 2 m high banks. The slopes are concave shaped, but generally rise at an 85 degree angle from the water level. They are 80% grass-covered. Adjacent land use is pasture and woodlot. This particular site extends for 70 m, however, additional undercutting sites occur downstream.

Recommendation: Regrade and vegetate the bank.

TOPO-J18-1-3-E

(rating 2)

A fenced off area extending into the river gives livestock access to the river causing trampling of the 2.5 m high banks at this site. The 30 degree slopes are 5% grass-covered. This site on the east bank is 4 m long.

Recommendation: Apply riprap to the slope to protect against further erosion.

TOPO-J18-1-4-W

(rating 2)

This site is located on the west bank of the Talbot, close to highway 12. Undercutting of the 2.5 m banks affects a 75 m length of shoreline. The slopes in this stretch are concave. The toe of the slope forms approximately a 75 degree angle with the surface of the river, but it becomes steeper near the top of the bank where it is a 110 degree slope.

Downstream 10 m exists a site of minor cattle trampling. The site is 3 m long on a 20 degree slope.

Recommendation: Install gabion baskets. At the downstream site, construct a limited cattle access area using proper erosion controls.

Talbot River - Mainstream

TOPO-J18-1-5-E

(rating 3)

Undercutting of the 3 m high east bank for a distance of 20 m along the shoreline is the cause of erosion at this site. The 80 degree slopes are 10% grass-covered on some parts of the bank between slumped areas. The area adjacent to the undercut bank is residential.

Recommendation: Install gabion baskets.

TOPO-J18-1-6-W

(rating 3)

Natural bank undercutting is the cause of erosion at this site. The river at this point is 10 m wide and 1 m deep. It cuts into 3.5 m high west bank which is 80% grass-covered. Erosion extends for a length of 125 m along the 75 degree slopes. The adjacent area is used as pasture. This site is located just downstream of Gamebridge.

Recommendation: Install gabion baskets.

TOPO-M29-1-7-W

(rating 4)

At this site, natural undercutting and slumping affect the entire 3 m high west bank which makes a 90 degree angle with the river. Erosion affects a 300 m stretch of the 10% grass-covered shoreline. The river has already been fenced off from the adjacent pasture.

Recommendation: Construct a gabion basket wall along the eroded shoreline.

TOPO-M29-1-8-E

(rating 3)

Natural slumping on the 60 degree slope as well as cattle trampling are the causes of erosion at this site. The entire 3 m high east bank is being eroded for a distance of 100 m. The banks are only 50% grass-covered.

Recommendation: Regrade and vegetate the east bank. Fence the area to limit cattle access to the stream.

TOPO-M29-2-9-E

(rating 3)

The face of the 80 degree sloped east bank is eighty percent bare earth at this site. The problem is due to undercutting by the 13 m wide, 1 m deep river. The erosion problem extends for 35 m along the shore.

Recommendation: Construct a gabion basket wall along the eroded

Talbot River - Mainstream

shoreline.

TOPO-M29-2-10-W

(rating 4)

This site affects approximately 200 m of the 3.5 m high west bank which is at an angle of 90 degrees and is covered with 0 to 75 percent grasses. The adjacent fields are affected by the slumping and undercutting.

Recommendation: Regrading and revegetating the bank or installing gabion baskets.

TOPO-M29-2-11-W

(rating 3)

Erosion at this site affects approximately 120 m of the 6 m high west stream bank. The bank is a vertical wall undercut at the toe. The adjacent area is wooded. Farther down the stream, logs have obstructed the stream. The bank has very little or no vegetative cover.

Recommendation: Install gabion baskets or regrade the bank.

TOPO-M29-2-12-E

(rating 5)

This site extends for approximately 250 m along the 5 to 7 m high east bank. The bank is inclined at approximately 75 degrees and is up to 70% covered with grasses spread evenly along it. The major problems at this site are due to slumping and undercutting. Areas of bare earth are visible at the ends of this site. The stream is adjacent to a field at this point.

Recommendation: Regrade and revegetate, or install gabion baskets along the bank.

TOPO-M29-2-13-W

(rating 3)

At this site the 12 m high west bank is eroding for approximately 100 m. The angle of the bank is approximately 75 degrees; the bank has a 75% surface coverage of grasses, shrubs, and bushes. Undercutting of the bank, dumping (parts of an old car), and logs are the existing problems. The fallen trees may result in severe deflection during high flow periods. The adjacent area is a field.

Recommendation: Remove the dumped obstacles and regrade and revegetate the west bank. Stop further dumping.

Talbot River - Mainstream

TOPO-M29-2-14-E

(rating 3)

The problem at this site extends for approximately 100 m along the 3 m high east bank. Thirty percent of the surface of the bank is covered with trees and grasses. Severe undercutting has occurred and the slope ranges from 90-120 degrees. The adjacent area is wooded and the roots of trees and shrubs that help hold the bank in place have been exposed.

Recommendation: Install gabion baskets and/or riprap the east bank.

TOPO-M29-2-15-E

(rating 4)

Erosion at this site affects the 2 m high east bank for approximately 50 m. The bank has a 10% coverage of grasses. Beyond the 85 degree slope, the problem affects the adjacent fields. Slumping and undercutting are the major problems.

Recommendation: Regrade and revegetate the bank.

TOPO-M29-2-16-E

(rating 3)

The east bank is undercut for approximately 25 m at this site. The 2 m high bank has very little grass cover (10%), and is at an angle of 85 degrees. The adjacent area is wooded and trees have fallen into the river.

Recommendation: Regrade and revegetate the east bank.

TOPO-M29-2-17-W

(rating 4)

Undercutting at this site extends for approximately 75 m along the west bank. The bank has a slope of approximately 90 degrees and is approximately 30% covered with grasses. Fence rails are falling down the bank. The width of the stream at this point is 13 m.

Recommendation: Regrade and revegetate the bank. Certain locations may require the use of gabion baskets.

TOPO-M29-2-18-W

(rating 3)

This problem site extends for approximately 35 m along the 10 m high west bank at a bend in the stream. Approximately three quarters of the bank is covered with trees, shrubs, and bushes. Undercutting and slumping both occur at this site. Branches that have been gathered and placed along the bank help to reduce erosion.

Talbot River - Mainstream

Recommendation: Groynes may be used to deflect the current away from the bank. The effect on the opposite bank must be considered.

TOPO-M29-2-19-W

(rating 2)

This problem site extends for approximately 35 m along the 1-1.5 m high west bank which has an approximate angle of 85 degrees. The adjacent area is covered with grass. Due to undercutting at this site a page wire fence has collapsed into the stream at two different locations.

Recommendation: Regrade and revegetate the bank. Relocate the fence.

TOPO-M29-2-20-E

(rating 4)

The bare 4.5 m high east bank at this site has an approximate angle of 80 degrees. This site is close to the road (XI concession). Undercutting is the major problem along the 20 m of bank at this site.

Recommendation: Regrade the slope and/or use a gabion basket retaining wall.

TOPO-M29-2-21-W

(rating 4)

This site extends for approximately 100 m along the west bank of the 15 m wide stream. The bank is thinly covered with grasses and has an angle of approximately 85 degrees. The field adjacent to the stream is affected by this erosion. Farther downstream, a fence has fallen into the stream due to undercutting.

Recommendation: Install a gabion basket retaining wall.

Talbot River - Tributary A

No problems were found on this stream channel.

Talbot River - Tributary B

TOPO-M28-TB-1-EW

(rating 2)

This site extends along the stream channel from the cattle pasture north of the first concession in Mara Twp., to the junction of the tributary and the main stream, just south of the first concession. Natural undercutting and slumping of the 0.5 - 2.0 m banks occurs

Talbot River - Tributary B

on the bends of the meanders. Erosion affects all of the 80% grass-covered banks of the 1.5 m wide, 0.5 m deep stream. There is one minor gully south of the first concession 20 m long and 0.5 m deep which may erode back into the adjacent area.

Recommendation: Regrade and vegetate the banks where required. Fence to restrict cattle access, construct controlled access stations if required.

TOPO-M28-TB-2-EW

(rating 1)

A small 0.2 m wide tributary joins tributary B on the west bank south of the first concession. Cattle access and trampling have caused most of the erosion along the 90% grass-covered 1 m high east bank. Due to natural meandering, undercutting and slumping the west coincident bank valley wall is eroded 4 m up the bank for a length of 100 m. This site is not rated higher because of the amount of cover on the bank, the small size of the tributary, and the distance of site from the main stream.

Recommendation: Fence off the tributary from cattle. Construct limited livestock access area to stream. Regrade and vegetate.

TOPO-M28-TB-3-EW

(rating 3)

At this site, the tributary flows south of a barn with a manure pile 20 m from the 1 m wide stream. The adjacent area is pastureland as evidenced by the trampled stream banks. There is minor natural undercutting and slumping of the 20% grass covered 1-2 m high banks which have slopes of 30-90 degrees. Erosion affects all of the bank for a length of 150 m along the shoreline.

Recommendation: Fence off the stream from the cattle and construct a cattle watering station. Regrade and vegetate the stream banks. Encourage the farmer to use proper manure storage techniques.

Talbot River - Tributary C

TOPO-M25-TC-1-EW

(rating 4)

Downstream from the culvert that allows this tributary to flow under the Trent Canal is a site of cattle and horse trampling, garbage dumping, and natural undercutting on meanders of the 2 m high 50% grass-covered banks. The area adjacent to the west bank is pasture. A feedlot and a manure pile are 10 m from the east bank of the stream. This erosion extends 150 m along the shoreline.

Recommendation: Fence off the stream from livestock and regrade

Talbot River - Tributary C

and vegetate the streambanks. Encourage proper manure storage techniques and clean up the debris at the site.

TOPO-M25-TC-2-EW

(rating 3)

South of the Trent Canal, just before the stream flows under the road there is an erosion site. In this area the stream is 2 m wide and has 1.5 m banks at a 45 degree angle to the stream surface. A manure pile is situated 5 m from the stream and there is a tile outlet on the west stream bank. Trampling has caused erosion on the entire bank for a distance of 75 m along the shoreline which is 50% grass-covered.

Recommendation: Fence off the stream from cattle and regrade and vegetate banks. Encourage the farmer to use proper manure storage techniques. Construct a cattle watering station.

TOPO-M25-TC-3-E

(rating 3)

At this site the stream is 2 m wide and 0.5 m deep. The 2 m banks which are at a 75 degree angle with the stream surface have been trampled by cattle and undercut by natural stream processes. The erosion affects all of the bank for an extent of 85 m.

Recommendation: Fence off stream from cattle and regrade and seed banks. Construct a cattle watering station.

TOPO-M25-TC-4-E

(rating 1)

This erosion site is caused by natural streambank erosion of the 2.5 m east high bank. Undercutting and slumping affects all of the bank for 15 m along the east shore. This erosion is cutting into a front lawn of a house.

Recommendation: Regrade and seed.

TOPO-M25-TC-5-EW

(rating 2)

This site description refers to the area where the north and south branches of the tributary join. Natural undercutting and slumping occurs for a total distance of 750 m along bends in the 1 m wide streams. The 0.25-2.0 m high banks are 80% covered with grasses and have slopes of 45-80 degrees. Riprap has been placed on one bend to prevent erosion. Some cattle trampling was evidenced.

Recommendation: Regrade and seed banks. Construct limited cattle access area.

Talbot River - Tributary C

TOPO-M25-TC-6-W

(rating 2)

Undercutting and slumping of the 0.5-1.0 m banks occurs along this stretch of the south branch as it flows out of a wooded area along a road. The bank slopes down from the road at an angle of 75 degrees and is 60% grass-covered. This site is 4 m in length.

During high flow periods, erosion may also occur 10 m upstream from this site where a broken culvert emerges from the bank.

Recommendation: Fill, regrade and vegetate the stream bank. Repair culvert and protect the area surrounding the culvert opening from erosion by using riprap.

TOPO-M25-TC-7-W

(rating 1)

At this site a gully is forming due to runoff from a nearby field. It extends 10 m back from the stream and has a depth of 0.1 m. The area is wooded and at the confluence of the stream and the gully the stream banks are 75% grass-covered and 0.5 m high. It appears as though the gully would dry up during the summer.

Recommendation: Stabilize the bank with filter mat and riprap at the mouth of the gully.

TOPO-M25-TC-8-EW

(rating 1)

Just north of highway 48 and west of the bend in the road, cattle have access to the 0.5 m wide north branch. Cattle trampling has eroded all of the 1 m high banks for an extent of 100 m. The 30 degree slopes of the banks are 100% grass-covered.

Recommendation: Construct controlled livestock access area.

TOPO-M28-TC-9

(rating 2)

Near the source of the north branch of tributary C there is a gully 10 m long with a depth of 2 m running from a pond to the stream. There is an accumulation of branches in the gully. A nearby fence has partially fallen into the gully and further erosion will affect the adjacent field.

Recommendation: Clean up site. Construct a rock chute from the pond to the stream.

Bluffs Creek - Mainstream

TOPO-J20-1-EW

(rating 2)

Sand and silt clogs the stream bed at this site just upstream of Orillia concession 2. Undercutting of the 1.5 m high 80 percent grass covered banks as well as runoff from the logged area adjacent to the stream are the sources of this sediment. The stream along this 100 m stretch is 5 m wide and 0.5 m in depth.

Recommendation: Reforest the adjacent area or establish a buffer strip. Install log riprap on the undercut banks.

TOPO-J20-2-E

(rating 3)

Undercutting and slumping of the 5 m high east bank is the form of erosion at this site just east of Highway 11. The 80 degree slope is 30 percent grass covered and has been undercut for a length of 8 m along the shoreline. Since no erosion control measures were used when a pond was put in nearby, the exposed earth may also be contributing sediment to the stream.

Recommendation : Vegetate the adjacent area and install gabion baskets on the undercut bank.

TOPO-J20-3-EW

(rating 2)

At this site an obstruction of trees and logs caused a partial diversion of the stream. Flow has cut into the west streambank creating a new channel 20 m in length around the obstruction. The stream is 3 m wide and has a maximum depth of 1 m just before it meets the obstruction. The stream banks are 1.5 m high and form 90 degree angles with the stream surface. They are 85 percent grass covered. Undercutting of both old and new channels on their downstream ends has affected a 20 m stretch on the west channel and a 5 m stretch of the east channel.

Recommendation: Clear the obstruction and install log riprap along the undercut banks.

OE8-J21-4-W

(rating 2)

An obstruction of trees and logs has caused the stream to create a new channel 12 m in length, 50 cm deep, and with bank slopes of 90 degrees. Upstream of the obstruction the stream is 1.5 m wide and 15 cm deep. The new channel is used only during high flow periods. The obstruction aggravated an undercutting problem upstream in times of high flow.

Recommendation: Clear the obstruction. Regrade and vegetate the banks.

Bluffs Creek - Mainstream

OE8-J20-5-E

(rating 2)

Natural undercutting of the 4 m high east bank is the cause of erosion at this site. The erosion by this 2.5 m wide, 80 cm deep stream is causing a large cedar to fall into the stream. Undercutting extends 10 m along the 60 degree slope which is 10 percent tree covered. The adjacent land use is wooded and residential.

Recommendation: Install a gabion wall on the problem area.

OE8-J20-6-EW

(rating 1)

An obstruction of trees and logs has caused erosion of the 90 degree banks. This minor undercutting affects all of the 60 cm high, 50 percent bush and tree covered slope. Erosion extends for a length of 6 m along the shoreline.

Recommendation: Clear the obstruction. Regrade and vegetate the banks.

OE8-J20-7-W

(rating 2)

At this site, natural undercutting of the 3.5 m high west bank is the major cause of erosion. The 60 degree slope is well vegetated near the stream, but is bare near the top of the bank. Another source of sediment may be runoff from a nearby scrub covered field. At this site the stream is 2 m wide and 20 cm deep. The problem extends for a length of 8 m along the bank.

Recommendation: Construct a runoff diversion channel. Plant vegetation to stabilize the bank.

OE8-J20-8-W

(rating 1)

Branches in the stream have formed an obstruction in the 3 m wide, 40 cm deep stream channel. A new 15 m channel, 30 cm deep has been cut through the west bank. Ponding has occurred upstream of the obstruction.

Recommendation: Clear the obstruction. Vegetate the banks of the new channel.

OE8-J20-9-EW

(rating 2)

This site is found immediately downstream of Oro concession 13. Minor undercutting affects all of the 40 to 80 cm high banks. Cattle access to the 3 m wide, 30 cm deep stream has also caused erosion of the 30 to 90 degree slopes. Trampling of the 50

Bluffs Creek - Mainstream

percent grass and bush covered banks extends for a length of 250 m.

Recommendation: Regrade and revegetate the banks where necessary. Restrict cattle access by fencing the stream and building a cattle watering station.

OE7-J21-10-EW

(rating 1)

Just downstream of Oro concession 9 at this site there is cattle access with very minor trampling. At this point the stream is in the form of a grassed waterway which would primarily carry spring flows. The waterway at this time is 10 cm wide with a depth of 5 cm.

Recommendation: Fence off the stream to reduce cattle access and build a cattle watering station.

Bluffs Creek - Tributary A

TOPO-J25-TA-1-W

(rating 1)

An old rail fence has fallen into the stream because of slumping and undercutting for 5 m along the outside bank of a bend in the stream. The 1/2 m wide stream is at the western edge of its 10 m floodplain and has eroded the 1 m high west bank so that it overhangs the stream.

Recommendation: Deflect the stream towards the centre of the floodplain, perhaps by using a groyne on the outside bank.

TOPO-J25-TA-2-E

(rating 2)

On the outside (east side) of a bend in the 2 m wide stream the 70 cm high bank is being undercut. Just downstream on the same bend the 2 to 4 m high, 90 degree angled bank has been stripped of vegetation apparently because of runoff and seepage from the adjacent scrub land and high flow undercutting. A few trees along the 25 m long site threaten to fall into the stream.

Recommendation: Use gabions to stabilize the lower undercut bank. The site is rather isolated but installation of a retaining wall and seepage drain may be necessary.

TOPO-J25-TA-3-EW

(rating 3)

Trampling by cattle has occurred along 400 m of the stream and along a 170 m long tributary as these streams meander through open pasture and light forest. The trampling of the 20 to 30 cm high

Bluffs Creek - Tributary A

banks was only severe for about 100 m but it was extensive throughout the pasture. There was also a manure pile located 25 m from the stream near the upstream end of the site.

Recommendation: Fence to restrict cattle access to the stream. Relocate the manure pile or install a proper storage facility.

TOPO-J25-TA-4-E

(rating 2)

The 1 to 1.5 m high east bank along the outside of a bend has been undercut by the 1.5 m wide stream and is now concave in shape. The area to the east is wooded but the stream is next to a barnyard on the west side.

Recommendation: Use log riprap to stop the undercutting while maintaining a possible fish habitat.

OE8-J25-TA-5-W

(rating 1)

The banks of the 75 cm wide stream have been trampled by sheep and cattle for approximately 100 m. At this site, the 1 1/2 m high west bank is undercut. The bank angle is about 90 degrees at the upstream end and gradually becomes 60 degrees along the 10 m long, 70 percent grass covered site.

Recommendation: Fence to restrict livestock access. Regrade and vegetate the undercut area.

OE8-J25-TA-6-W

(rating 1)

Immediately downstream of Oro concession 12 a grain field has been tilled right up to the west streambank. The streambed is covered by sediment.

Recommendation: Establish a buffer strip between the tilled field and the streambank.

Bluffs Creek - Tributary B

OE8-J21-TB-1-W

(rating 2)

Natural undercutting of the sandy 2.5 m high west bank bordering a cedar bush is the form of erosion at this site. Erosion affects all of the 80 degree, 5 percent tree covered slope. This particular site extends for a length of 8 m along the 2.5 m wide, 10 cm deep stream. A log in the stream is acting as a natural deflector sending the current away from the undercut bank.

Downstream 20 m, more minor undercutting is taking place due to a

Bluffs Creek - Tributary B

grass island obstruction.

Recommendation: Install a more effective deflector. Clear the obstruction 20 m downstream.

Bluffs Creek - Tributary C

OE7-J21-TC-1-W

(rating 1)

A row crop is growing in the field on the west bank and there is a pasture on the east bank. Runoff water from the pasture flows down a bare slope to reach the stream. Runoff from a manure pile 40 m from the east streambank may affect water quality. At the site the stream channel was almost dry and well vegetated.

Recommendation: Seed the exposed slope to prevent the loss of soil. Encourage proper manure storage techniques.

Hawkestone Creek Mainstream

O3-J19-1-W

(rating 3)

At this site undercutting and slumping are the major problems afflicting the 6 m high west bank. The adjacent areas consist of both wooded land and residential land. The bank slopes at an angle of 60 degrees and has a 25 percent surface coverage of grass. Also, further upstream, a similar problem on the 2.5 m high banks exists. On top of this slope a pile of barrels is visible.

Recommendation: Regrade and revegetate the bank.

O3-J19-2-W

(rating 2)

This site, located beside the Hawkestone Community Park has both undercutting and slumping problems. The slope of the 3 m high west bank is divided into two sections; 90 degrees at the top of the bank and 70 degrees at the toe. The bank has a 30 percent coverage of grass, with greater coverage at the toe. This site extends for 30 m. About 100 m upstream there is also a minor site of undercutting on the east bank. The roots of the adjacent cedars are holding this bank.

Recommendation: Regrade and revegetate or install a filter fabric and riprap lining.

O3-J19-3-E

(rating 1)

High flows at this site have caused undercutting and slumping of the east bank. The bank height is about 3.5 m and has a slope of 70 degrees. Most of the 25 m long problem area is covered with grass and sumac. The adjacent area is wooded, two cedars are about to fall into the stream.

Recommendation: Regrade and revegetate the bank or install a gabion basket wall.

O3-J19-4-W

(rating 2)

This site extends for an approximate length of 50 m from just downstream of a newly built road to the first bend in the stream. Slumping and undercutting are the major problems. Some fallen trees have created an obstruction which causes more erosion of the west bank. The height of the bank is 4.5 m, it has a 60 percent vegetative cover of leaning trees, grasses, shrubs and bushes. The bank angle is about 75 degrees. The stream width is 3 m and it has a 0.5 m depth. The adjacent area is wooded.

Recommendation: Regrade and vegetate the bank or install a gabion basket wall.

Hawkestone Creek Mainstream

03-J19-5-W

(rating 1)

The west bank at this site in a wooded area is 10 m high. There is a 5 m section of 80 degree bank that has almost no coverage. The problem here is slumping and undercutting. A hard layer of clay at the toe of the slope seems to slow the erosion process.

Recommendation: Riprap the lower portion of the bank with any stone available at or near the site (the problem is minor and transporting stone or machinery to regrade the bank to the site would be difficult). Regrade and revegetate the upper portion of the bank.

03-J19-6-E

(rating 1)

This site is in a wooded area. Slumping and undercutting are the major problems. The east bank is about 3 m high, 40 percent covered with grasses, shrubs, and bushes, and is at an angle of 75 degrees. This site extends for about 20 m along a bend. There is also a similar site 50 m upstream.

Recommendation: Install log riprap or regrade and vegetate the bank.

03-J19-7-EW

(rating 2)

Fallen trees and sediment deposits have blocked the stream. Flow around this obstruction has resulted in undercutting along the east bank. Approximately 40 m upstream more signs of undercutting are apparent. The bank is 20 percent covered with trees, grasses, shrubs, and bushes. The adjacent area is wooded.

Recommendation: Remove the obstruction, regrade the undercut region and revegetate the bank.

03-J19-8-W

(rating 1)

Undercutting is the problem at this site in a wooded area just south of Highway 11. Some rocks appear to have been placed on the west bank to reduce erosion, but only half the 40 m length is covered. The bank is very steep and about 3 m high, with approximately 70 percent of the slope covered by grasses, shrubs and bushes.

Recommendation: Riprap or regrade and revegetate where necessary.

OE7-J19-9-EW

(rating 2)

At this site an obstruction created by fallen trees has caused

Hawkestone Creek Mainstream

water to back up behind it. Both banks are being eroded during high flow conditions such as spring runoff. The stream width is about 4 m, with the bank height ranging from 0.5 to 1 m at an angle of 40 degrees.

Recommendation: Remove the obstruction and install log riprap along the affected area.

OE7-J19-10-E

(rating 3)

Water flowing from a man-made pond has created a gully that stretches for a distance of 20 m. The gully has a depth that varies from 0.75 m to 1 m. Erosion is also occurring at the mouth of this gully on the east streambank.

Recommendation: Install a proper drainage outlet for water from the pond.

OE7-J19-11-EW

(rating 2)

Two separate problems affect the two banks at this site. On the east bank undercutting occurs along a length of 50 m; while on the west bank, horse access and trampling affect a 25 m stretch. The bank has a height of 0.3 m, an angle of 20 degrees, and coverage of 80 percent - mostly of grasses and shrubs.

Recommendation: Install log riprap or regrade and revegetate the east bank. Fence the west bank and construct a limited cattle access area.

OE7-J19-12-EW

(rating 2)

Factors contributing to erosion at this site include slumping, undercutting, trampling and a tree obstruction. The 0.5 - 0.8 m high bank is well covered with trees, grasses and shrubs. Trampling has increased the extent of erosion at the site of the obstruction. This site stretches for about 40 m. Adjacent to the stream at this site are pasture and wooded areas.

Recommendation: Install log riprap. Fence off the stream and construct a limited cattle access area.

OE7-J20-13-EW

(rating 1)

A beaver dam causes the diversion of flow around both of its sides during high flow periods. The reduced flow velocity due to the dam has caused much deposition just upstream of the dam. The adjacent areas are pasture and wooded land.

Recommendation: Remove the sediment from the streambed upstream

Hawkestone Creek Mainstream

of the dam. Clear the dam in order to prevent erosion of new channels and enable the water to resume its normal course.

OE7-J20-14-W

(rating 2)

Water leaking out from a well 8 m from the stream on the west bank has eroded several 0.1 m deep channels down to the stream. A second problem has been created by a small man-made dam in front of the house. Water flowing around the dam on the east has cut a new channel 0.5 m wide.

Recommendation: Provide a proper drainageway for the outflow from the well or stop the leakage. Remove or repair the dam.

OE7-J20-15-EW

(rating 4)

The problem at this site is due to cattle trampling. The area affected extends for about 850 m, 70 percent of which is through a lightly wooded area. Due to the soft wet ground, the trampling extends back from the stream for up to 20 m on the west bank and well into the pasture on the east bank. Runoff, especially from the hilly west bank, would likely carry much soil and manure into the stream. The bank is about 0.2 m high and is at most 50 percent covered with grass.

Recommendation: Fence off the stream and construct stable cattle access areas. Riprap the areas where severe trampling has caused erosion.

Hawkestone Creek - Tributary A

No problems were found on this stream channel.

Hawkestone Creek - Tributary B

No problems were found on this stream channel.

Hawkestone Creek - Tributary C

OE7-J20-TC-1-W

(rating 1)

The rail fence at this site is falling into the stream because of the undercutting of the bank that borders the adjacent hay field. The bank is well covered with grass and has a 20 degree slope. This site is located just downstream from concession 8 of Oro Township.

Recommendation: Relocate the fence, regrade and seed where necessary and create a vegetated buffer strip.

Allingham Creek - Mainstream

O3-J13-1-E

(rating 2)

Undercutting and slumping are occurring on the 2 m high east bank along a straight 10 m long section of the stream 70 m from the lake. Slumping has already cut into a playground path along the top of the bank. There are also three minor gullies - all about 2.5 m long and 40 cm deep - at the corners of a bridge 20 m upstream of the undercutting.

Recommendation: Reroute the footpath or install gabion walls to protect it from slumping. Riprap the bank at the bridge to prevent erosion from runoff.

O3-J13-2-EW

(rating 3)

As the 2 m wide stream meanders for 150 m through a residential area, it is undercutting and causing slumping of the 1 to 3 m high, 90 degree bank. Sand and concrete blocks have been dumped at one point on a 3 m high bank in an attempt to stop erosion of a driveway but this sand is already being carried away by the stream.

Recommendation: Install gabion walls or place riprap in the stream bends. The lower, less severely affected banks may be regraded and vegetated.

O3-J13-3-E

(rating 1)

In this wooded area there is a 35 m long gully about 80 cm deep on only a very slight grade. It cuts the 40 cm high east bank about 30 m downstream of the bridge (through a narrow inlet about 10 cm wide). In addition, 20 m upstream of the bridge there is a tile drainage outlet from a residential property. The tile itself is protruding half a metre out of the bank.

Recommendation: Riprap the gully where it enters the stream, and monitor it for any changes in size. Reconstruct the tile outlet. Use a steel or plastic outlet pipe as clay tile could easily break off.

O3-J13-4-E

(rating 1)

A wooden fence is falling into the stream because of undercutting along a 12 m stretch of the 80 degree angle, 1.5 m high east bank. The area is thickly wooded and inaccessible to vehicles.

Recommendation: The fence should be moved back from the stream and log riprap may be used to protect the bank from undercutting.

Allingham Creek - Mainstream

O3-J13-5-EW

(rating 1)

About 50 m downstream of the train tracks the stream meanders for 80 m along the edge of pasture land and suffers from undercutting and slumping on the bends. The banks are vertical and are 0.75-1.5 m high. One large tree along the east bank has been undercut and is in danger of falling.

Recommendation: Regrading and vegetating the banks on the bends would be a solution. However, regrading would require the removal of some trees. Log riprap may be preferred.

O3-J13-6-E

(rating 2)

Natural undercutting of the 2-3 m high, 75 degree sloped east bank is the cause of erosion at this site 200 m upstream of the point where the railroad crosses the stream. Erosion extends along a 15 m stretch of the 2 m wide stream and affects all of the 30 per cent grass and brush covered slopes.

Downstream 70 m exists a similar site where the stream undercuts trees on a meander bend.

Recommendation: Regrade and seed or install gabion walls on the eroded banks.

O3-J13-7-E

(rating 1)

In this wooded area a semi-circular gully 50 m long and 10 cm deep cuts the 1/2 m high east bank in two spots. At the downstream end the water flows underground through a 20 cm wide hole in the bank. Erosion in the gully itself is minimal because the water is low and moving very slowly.

Recommendation: Uncover the downstream end to prevent water blockage during high flow periods and the undermining of trees. Riprap the bank at both gully entrances. Investigate possible gully control measures.

O3-J13-8-EW

(rating 2)

For about 400 m downstream of Oro concession #9 the streambanks suffer from undercutting and slumping on the bends and from cattle trampling. The average angle of bank, height of bank and stream width are 80 degrees, 1 m and 1 m respectively in this narrow pasture between a farmhouse and barn.

Recommendation: Regrade and revegetate the banks, fence to restrict access and construct a controlled cattle access area.

Allingham Creek - Mainstream

O3-J13-9-W

(rating 2)

Slumping and undercutting are affecting all of the 2.5 m high vertical west bank the erosion is cutting into a lawn. The site is just upstream of Oro concession #9 at a slight bend in the stream. Three plastic pipe outlets are present here but have caused negligible erosion.

Recommendation: If several trees are removed the bank may be regraded and vegetated. Otherwise, a gabion wall should be installed.

O3-J13-10-EW

(rating 1)

Natural undercutting of the 2.5 m high banks has formed slopes of 90 degrees. The field at the top of the bank is used for growing grains, while the area on the opposite stream bank is wooded. Large rocks in the stream at the base of the undercut bank have caused a minor diversion of the stream flow which has started to cut into the opposite bank. The stream width at this point is 1.5 m and the maximum depth is 30 cm.

Recommendation: Install a gabion wall along the undercut bank. Rearrange the rocks creating the obstruction to prevent further erosion due to diversion of the stream. Regrade and vegetate the area along the west bank that was eroded by the diverted stream.

O3-J13-11-EW

(rating 2)

A log bridge is sitting in about 20 cm of water at this tractor crossing in a strip of woods between two fields. Some of the stream flow has been forced to go around the east side of the bridge. During high flow periods the east bank is eroded and the bridge may be washed downstream. In addition, a bulldozer has recently crossed here flattening the previously 1/2 m high bank, stripping it of vegetation, and churning up the streambed.

Recommendation: At this time the maximum water depth is about 20 cm. The bridge should be removed. The banks should be reconstructed, revegetated and riprapped through the crossing.

O3-J14-12-EW

(rating 3)

For about 200 m through maple bush both the 2 m high west bank and 60 cm high east bank suffer from undercutting and slumping. The winding stream is 1 to 2 m wide. However, the 80 degree stream banks are about 5 m apart suggesting that the sandy loam soil of the banks is easily eroded and that the stream widens appreciably during periods of high flow. There is a log and boulder obstruction which has caused diversion of the flow and undercutting of the east bank near the middle of the site.

Allingham Creek - Mainstream

Recommendation: Clear the obstruction. Regrade and vegetate the lower east bank and install log riprap or gabion walls on the higher, more thickly forested west bank.

Allingham Creek - Tributary A

O3-J14-TA-1-EW

(rating 2)

Large holes up to 1 m deep have formed near the edges of a seldom used bridge near the back of a farm. Two of the three concrete culverts that form the bridge are actually visible through the holes. The stream is almost dry at this site and turns into a ditch directly upstream.

Recommendation: Remove the bridge or fill the holes and install a riprapped runoff channel or a drop structure to stop erosion of the bridge and reduce the amount of sediment going into the stream.

Burts Creek

03-J14-1-EW

(rating 2)

The location of this site is 200 m upstream from Lake Simcoe. The problem extends for 50 m along a straight section of the 1.5 m wide stream where there is slumping and undercutting on the 70 cm high, 80 degree banks. The east bank forms the edge of a cottage driveway. The bare banks are of a clay soil with many rocks and pebbles in it.

Recommendation: Regrade and revegetate the banks of the stream.

03-J14-2-EW

(rating 1)

Sites of minor undercutting and slumping may be found for 125 m as the stream gently winds alongside a parking area and lawn. The average height of the vertical banks is 1.5 m and they are bare halfway to all the way up. There is a 4 m long 1 m deep gully at the edge of the parking lot, but boulders at the base of the gully have reduced erosion.

Recommendation: Riprap the gully or install a berm and drop outlet for runoff from the parking lot. Install gabion walls or log riprap at the undercut sites.

03-J14-3-EW

(rating 1)

This site is located in an area of dead trees and knee high grasses. There is undercutting and slumping on the outside of a bend in the 80 cm wide stream. The site extends for about 10 m along the 1 m high, vertical east bank that has an approximately 50 per cent grass coverage.

Recommendation: Treatment of this site would be labour intensive since it is inaccessible to machinery. The vertical slope could be regraded and vegetated or log riprap could be used. The site should be monitored and treated only if it grows and becomes a major source of sediment.

03-J14-4-EW

(rating 1)

Beginning at the railroad a stretch of undercutting and slumping continues upstream for about 150 m on the 60 cm high banks. The stream is about 1 m wide and up to 20 cm deep in this area of hardwood bush. Water has been forced to reroute around a log jam and has added to erosion of the east bank.

Recommendation: Monitoring the site for future further problems is sufficient for now. If the problem worsens, clear the obstruction and regrade and vegetate with plants that will grow on these shaded banks.

Burts Creek

O3-J14-5-EW

(rating 3)

Undercutting, wind and age have combined to topple a huge tree across the 1 m wide stream 15 m downstream of the road. The 4 m high, vertical west bank has been left bare and very susceptible to erosion by run-off. There is a beaver dam 3 m upstream of the tree which has backed up water through a culvert under the road and forced water to cut through the east bank to get back to the mainstream.

Recommendation: Use a gabion wall to prevent further erosion of the bank. Clear the beaver dam to allow the stream to resume its normal course and relocate the beavers if necessary.

O3-J14-6-EW

(rating 1)

Cattle have trampled the 1 m high, near vertical banks on both sides of the stream for about 100 m upstream of the road. The stream is about 1 m wide with a maximum depth of 20 cm. On average the banks are 85 per cent covered with grass, although some totally bare spots exist.

Recommendation: Construct a limited access area on the stream for the cows. Regrade, vegetate and fence off the banks outside the access area.

O3-J14-7-W

(rating 2)

Flow in the 75 cm wide stream has caused undercutting and slumping for about 8 m along the edge of a hay field. The undercut west bank is vertical and about 2 m high.

Recommendation: Install a gabion wall where the stream borders the hay field and create a buffer strip between the field and the stream.

O3-J19-8-EW

(rating 1)

In a pasture between the junction of a small tributary and concession 8, there is a 100 m stretch where cows have trampled the 1.5 m high, 60 degree banks. The banks are fairly well grassed except for a 10 m long stretch that has only a 10 per cent coverage.

Recommendation: Revegetate the banks and fence to restrict cattle access.

Burts Creek

O3-J19-9-EW

(rating 2)

Undercutting and slumping occurs intermittently for about 50 m on both streambanks. The banks are about 1 m high, have angles of 60 to 80 degrees and form the boundary for the adjacent sods fields. The stream was nearly dry when examined.

Recommendation: Regrade and vegetate the banks or install log riprap along the banks. Create a buffer strip between the sod field and the banks.

Unnamed Stream at Oro Beach - Mainstream

O2-J4-1-E

(rating 1)

The problem at this site is undercutting and slumping. Approximately 10 m of the east bank are affected. The adjacent area is a field that is fenced along the bank. The stream at this site is approximately 2 m wide and 0.25 m deep. The bank ranges from 0.75 to 1.5 m high and is at an angle of 65-80 degrees with about 15% grass coverage. Some riprap has been placed along the bank, but there is none where the problem exists.

Recommendation: Regrade and seed or riprap the bank.

O2-J4-2-EW

(rating 1)

At this site, the problems are due to gullying, slumping, and undercutting. Several short gullies exist on both sides of the stream; their lengths ranging from 5-7 m with an average depth of 0.3 m. These gullies or rills may have been caused by spring runoff. The banks are falling in to the stream and a significant amount of soil deposition both on the banks and in the water has occurred. The adjacent area consists of wooded land and fields. The stream is about one meter wide and has an average depth of 0.4 m. The bank is mostly covered with grasses and shrubs.

Recommendation: Install checkdams and runoff diversion berms in areas where gullies have created erosion.

O2-J4-3-W

(rating 4)

At the point where tributary A joins the mainstream there is severe undercutting and slumping. The adjacent area consists of fields. The bank has a coverage of 50% trees and grasses. The bank is at a 90 degree angle and has an approximate height of 0.3 m. The problem affects a 20 m length of bank. The stream width is 1 m and the stream depth is .3 m at this site.

Recommendation: Regrade the bank, riprap the point where the two streams meet.

O2-J4-4-E

(rating 2)

Slumping and undercutting are the major problems at this site. The banks are about to slide into the river. A shallow gully with an approximate length of 20 m is also present. This problem area stretches for a length of 50 m along the east bank. Stream width is 1 m and depth is .25 m here. A large quantity of soil has been deposited at a point 20 m downstream.

Recommendation: Regrade and riprap the soft banks; use appropriate control measures for the gully.

Unnamed Stream at Oro Beach - Mainstream

O2-J4-5-EW

(rating 4)

The major problems are slumping and undercutting along this 350 m meandering section of the stream. One side of the stream has a much higher bank (6 m) than the other (1 m). There are areas of erosion on both sides of the stream. Farther upstream at the start of this section, a fallen tree has blocked the waterway and a little erosion is occurring as the stream flows around it. The adjacent area is wooded on one side and is a field on the other. The coverage ranges from 10-70 percent of trees and grasses. The streams' width and depth are 2 m and 0.2 m respectively.

Recommendation: Remove the obstruction and regrade the banks, use seeding and riprap where required.

O2-J4-6-E

(rating 2)

An area of severe undercutting, stretching for a length of 20 m along the east stream bank, has exposed the roots of trees and other vegetation. The coverage is 20% of grasses. The angle of the bank is greater than 90 degrees. The stream here has a width of 1.5 m and a depth of 0.3 m.

Recommendation: The trees and surrounding vegetation are holding the banks in place. Monitor the site for any changes.

O2-J4-7-W

(rating 1)

Undercutting of the west bank may cause trees to fall into the stream. Grasses growing on the slopes provide coverage of about 50%. The slope of the banks ranges from 75-85 degrees, and the bank height is 2 m. The streams' width and depth are 2 m and 0.2 m respectively.

Recommendation: Regrade the slopes and plant a vegetative lining.

O2-J4-8-EW

(rating 3)

Erosion affects the stream for a distance of 400 m as it meanders through a cattle pasture. Trampling, slumping, and undercutting have occurred. At one point a telephone pole is threatened by slumping. At another, manure is piled on a slope above a water well. The adjacent area consists of a fallow field and a driveway. The stream width here is about 0.75 m and the maximum depth is 0.2 m. The banks have heights that range from 0.5-0.8 m, angles of 75 degrees, and a grass coverage of 60%.

Recommendation: Fence off the stream, regrade and revegetate the banks, and construct an appropriate cattle watering facility.

Unnamed Stream at Oro Beach - Mainstream

02-J4-9-EW

(rating 2)

This site stretches 5 m along the 3.5 m high, 80 degree angle, and 15% grass covered bank. Tractor crossings have been a major factor in causing erosion; signs of cattle trampling are also apparent. Farther upstream, about 10 m from the stream, a dump with scrap metal has been started. The stream has a width of about a meter and a maximum depth of 0.2 m.

Recommendation: Provide an appropriate tractor crossing and fence off the stream to prevent cattle access.

02-J4-10-W

(rating 2)

This site stretches for a length of 60 m along the 0.75 m high west bank. The erosion problem consists of undercutting and trampling. There is more manure piled along the bank. Farther downstream a dead tree that may fall into the stream could result in an erosion problem.

Recommendation: Regrade and riprap the eroding areas. Fence off the stream to prevent cattle access. Remove the dead tree.

02-J4-11-E

(rating 2)

Erosion affects two six meter wide sections of the east bank that are approximately 20 m apart in a meandering section of the stream. The cause of the problem is slumping, undercutting and trampling. The coverage on the banks is approximately 10%, covered with grasses. The adjacent area is row crop.

Recommendation: Regrade and riprap the problem areas.

02-J4-12-E

(rating 1)

Dumping has occurred along the east stream bank. The bank is mostly covered with grass and it has an angle of 20 degrees.

Recommendation: Remove the refuse to prevent erosion due to deflection or obstruction of the stream.

02-J4-13-E

(rating 2)

Slumping and undercutting have created the problem at this site. The adjacent area is wooded and tree roots have been exposed along the 2 m high east stream bank. The vegetative coverage along the bank is approximately 25%. This site extends for approximately 10 m.

Unnamed Stream at Oro Beach - Mainstream

Recommendation: Place riprap along the toe of the bank to prevent future undercutting.

O2-J4-14-EW

(rating 3)

A large gully stretching a length greater than 100 m has eroded into the bank west of the stream. Undercutting and slumping affect the bank near the gully. Further upstream, trampling of the east bank of the stream was apparent. The trampling worsened at the open field and this extended for 350 m upstream. A little fencing (electrified wire) was done to stop the cattle from entering the stream. The bank height ranges from 0.75 to 1.5 m, approximately at a 70 degree, and is covered with grasses and shrubs.

Recommendation: Use a proper drainage outlet for the ditch, and regrade and riprap the sides of the bank where erosion has occurred. Complete fencing off the areas where cattle have access and construct a proper livestock watering station.

O2-J5-15-EW

(rating 2)

There are two log obstructions along this 150 m stretch. At the downstream obstruction the stream has swollen from its normal 1 m width to 3 m. At the other site water has cut a new channel. The stream borders on pasture and there is some minor trampling upstream in the woods. The swollen .5 m deep stream is causing undercutting, slumping, and trees to fall from the 0.8 m high, well vegetated banks.

Recommendation: Clear the obstructions.

O2-J5-16-E

(rating 2)

A gully 6 m long and 1 m deep runs from a tiled outlet to a 0.8 m high bank on the streams' east side. Pieces of broken tile were found in the gully which cuts into a pasture 15 m downstream of a fence and forest.

Recommendation: Extend the tile down the gully to the stream. Riprap the stream bank below the new outlet and fill in the gully.

O2-J5-17-EW

(rating 1)

The normally 1 m wide 0.1 m deep stream has grown to about 5 m wide and 1 m deep behind a beaver dam in this wooded area. Two 0.5 m deep gullies, 7 m and 3 m long have formed because of the flooding. Along the 80 degree, 0.2-0.5 m high banks coverage is

Unnamed Stream at Oro Beach - Mainstream

about 40% and some trees are falling into the stream. Upstream 25 m there is another beaver dam and two more gullies, each about 0.1 m deep.

Recommendation: Clearing the dams will eliminate flooding and stop the flow of water through the gullies. The gullies may then be filled.

02-J5-18-E

(rating 1)

At the back of a lumber yard about 500 m downstream of Highway #11 there is a dump consisting mostly of gypsum board and scrap metal. The dump is as close as 1 m to the stream. Downstream from the dump, along a 300 m stretch through the woods there are several log obstructions that cause some water back-up and are creating gullies that are at most 0.5 m deep.

Recommendation: Stop dumping to avoid pollution and blocking of the stream. Clear the log obstructions downstream.

02-J5-19-E

(rating 2)

Runoff from Highway 11 flows out of two 0.5 m diameter circular steel culverts and has created gullies on the 6 m high, 65 degree east bank both upstream and downstream of the highway. The upstream and downstream gullies are approximately 15 and 3 m long respectively. Both gullies are about 0.8 m deep. There is also an 8 m wide beaver dam 20 m upstream of the highway through which a 1 m wide channel has been cut to allow water to flow. Water is being pumped out of the small, 1 m deep pond behind the dam.

Recommendation: Fill the gullies and riprap the banks below the culverts. The beaver dam should be removed to prevent flooding.

OE7-J5-20-E

(rating 2)

A gully 25 m long and .5 m to 1 m deep runs from a farmland drainage ditch down a 60 degree slope to the 1 m wide stream. The average water depth in the gully was only a few centimeters.

Recommendation: Fill the gully, construct a diversion to safely channel runoff to the stream.

OE7-J5-21-EW

(rating 2)

During spring, runoff water accumulated behind a log obstruction drowned vegetation on the 0.5 m high banks 1-2 m from the stream's edge leaving only mud and clumps of grass. A gully 8 m long and 0.5 m deep has also formed because of the flooding. The 1.5 m wide stream flows through a wooded buffer strip 20-30 m wide

Unnamed Stream at Oro Beach - Mainstream

bordered by row crops on the west and scrub on the east. A tiny tributary about 100 m long carrying water from a low lying area enters the mainstream at this site. The site extends 70 m upstream where it meets site #22.

Recommendation: Clear the log obstruction, fill the gully and revegetate the banks.

OE7-J5-22-EW

(rating 2)

A pond 60 m in diameter has formed behind a beaver dam in this wooded area. Undercutting has occurred along the 0.1-1 m high banks at the pond's edge. Because of the blockage, water has cut three new paths to the main stream.

Recommendation: Relocate the beavers and remove the dam. Fill in the newly cut stream courses and revegetate the area.

OE7-J5-23-EW

(rating 1)

During times of high flow a log obstruction caused by a wire fence has caused water to back up. For about 4 m upstream the 0.6 m high banks have been stripped of vegetation 1.5 m back from either side of the 1 m wide stream.

Recommendation: Clear the logs and raise the fence over the stream to prevent logs getting caught there again. Revegetate the banks.

OE6-J6-24-E

(rating 2)

Just upstream of the sixth concession there is a gully one meter deep and 7 m long cutting into a field of row crops. The gully seems to be growing due to slumping caused by runoff. The gully narrows as it cuts into the 0.8 m high east bank and enters the 1.5 m wide stream.

Recommendation: Fill in the gully and construct a waterway to safely drain field runoff.

OE6-J6-25-W

(rating 1)

A gully 4 m long and 1 m deep originates beneath 2 steel outlets (0.3 m diameter) and cuts through the one metre high west bank. The stream here is about 1m wide with a maximum depth of 0.5 m.

Recommendations: Fill the gully after extending the outlets down to the stream. Riprap the area below the reconstructed outlets.

Unnamed Stream at Oro Beach - Mainstream

OE6-J6-26-EW

(rating 2)

The largest beaver dam found on this stream system has flooded an area that has a diameter of approximately 300 m. Water flowing around the dam is eroding new stream channels. During spring runoff the adjacent farmlands may be flooded.

Recommendation: Remove the dam.

Unnamed Stream at Oro Beach - Tributary A

O2-J7-TA-1-EW

(rating 1)

Undercutting and slumping at this site affect 2 m along both banks. The problem appears to be due to a log obstruction behind a fence. This site is next to the road and near a 1.5 m diameter culvert. The banks are 90% covered with trees and reeds; the bank height is 0.3 m with an angle of 80 degrees. The adjacent area is wooded.

Recommendation: Remove the obstruction and raise the fence above the stream so that logs do not get caught again.

O2-J7-TA-2-W

(rating 2)

Log jams have caused a back-up of water and subsequent undercutting of the west bank. There is a great quantity of sediment deposited about 200 m upstream of this site. The area adjacent to the stream consists of a hay field and woodlands. The bank is 20% covered with trees and grasses. The bank's height ranges from 0.1 to 0.8 m and has an angle of 90 degrees.

Recommendation: Remove the log jams.

O2-J7-TA-3-W

(rating 3)

Spring runoff is cutting a new stream channel and has formed an island. Also, the formation of a gully 5 m long and 1 m deep has resulted in undercutting along the west stream bank. This stretch of undercutting runs for 15 m along a field. The bank is 85% covered with grass and trees and is at an angle of 90 degrees.

Recommendation: Prepare a proper channel to accomodate runoff.

O2-J7-TA-4-E

(rating 4)

A gully that cuts into the adjacent hay field has resulted in erosion of the east streambank. Slumping, undercutting, and signs of trampling are also present at this site that extends for about

Unnamed Stream at Oro Beach - Tributary A

25 m along a 40% grass and tree covered, 1 m high bank.

Recommendation: Fill the gully and construct an erosion resistant inlet for runoff. Regrade and seed where required.

O2-J7-TA-5-EW

(rating 2)

An eight m long section of trampled streambed is the result of tractor crossings. Most of the bank in this area is covered with grasses and trees.

Recommendation: Riprap the banks and the streambed.

O2-J7-TA-6-E

(rating 2)

Undercutting and slumping affect an approximate length of 70 m of the east streambank and threatens to topple a fence. A gully of length 8 m and depth 0.3 m aggravates the problem. The bank is 80% covered with grasses and trees and has an angle of 90 degrees.

Recommendation: Regrade and riprap the bank. Fill the gully and construct a channel for runoff.

O2-J7-TA-7-W

(rating 3)

Two gullies with lengths of 3 m and 12 m and depths of 0.3 and 0.5 respectively have created erosion problems along the west streambank. Minor trampling and deposition of manure are apparent in this area. Also, runoff from manure piled on an asphalt pad 3 m above and 8 m back from the stream edge may reach the stream. The banks in this area are totally covered with grasses and reeds.

Recommendation: Fill the gullies and construct diversion channels for the runoff, ensure that no contaminated runoff from the manure pile enters the stream.

O2-J7-TA-8-E

(rating 2)

Undercutting and slumping affect this 100 m long stretch that ends at a pond downstream. The bank has been cut away under a large tree and some trampling aggravates the problems along this meandering stretch of stream. The adjacent area is fallow land and the bank is 75% covered with grasses.

Recommendation: Riprap or regrade and seed the affected bends of the stream. Fence to restrict cattle access.

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